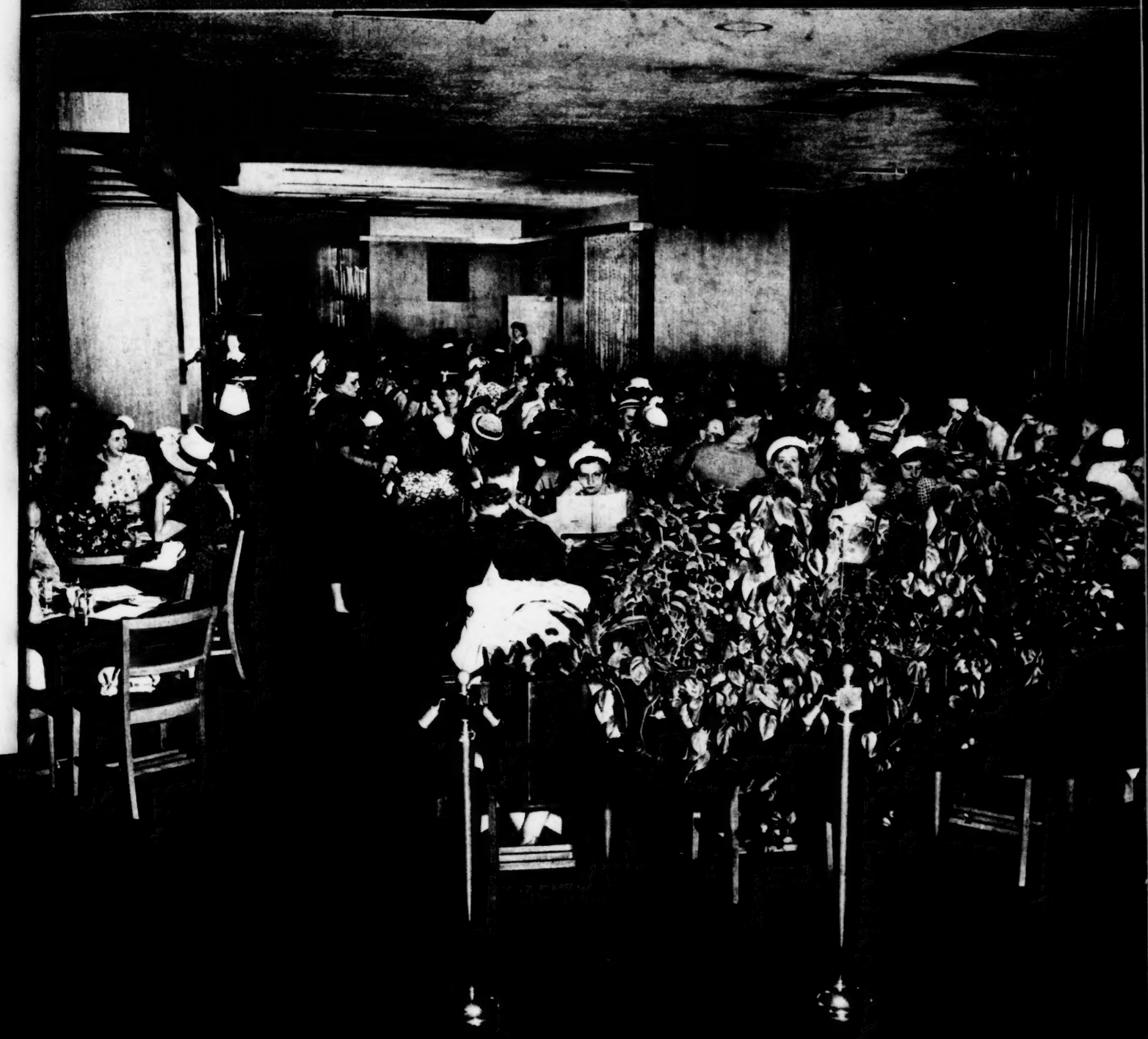
HEATING AND VENTILATING



"This Steam Trap is unconditionally guaranteed to satisfy you!"

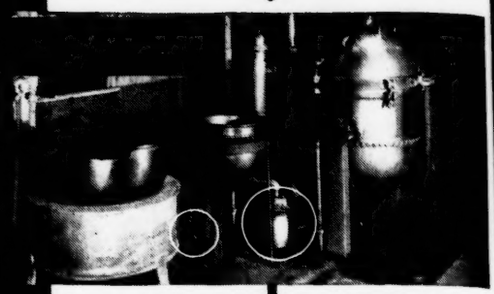
EVERY Armstrong steam trap is guaranteed to be free from defective workmanship or material, to function perfectly, to fulfill all claims in every respect and to give complete satisfaction.

ONLY A GOOD STEAM TRAP COULD *POSSIBLY* BE BACKED BY SUCH A GUARANTEE! To save fuel, to reduce maintenance, to get more work out of existing equipment, to get complete steam trap satisfaction, ask your nearby Armstrong representative to discuss with you the traps you need now.

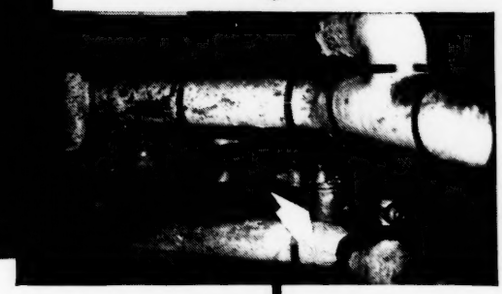
ARMSTRONG MACHINE WORKS
846 Maple St., Three Rivers, Mich.

SEND FOR YOUR COPY OF THE 36-PAGE ARMSTRONG STEAM TRAP BOOK explaining the design and workmanship that make the Armstrong guarantee possible. Complete data on the selection and installation of traps for all classes of equipment. Free on request.

YOU CAN'T LOSE



SAVED 3728 GALLONS OF FUEL OIL in one year after replacing old traps with Armstrong on kettles, low pressure heating system and cream beaters.—*Mary Lincoln Candies, Buffalo, New York.*



30% LESS MAINTENANCE with Armstrong traps on heating and steam distribution system.—*John Deere Harvester Works, East Moline, Ill.*

COOKING KETTLE OUTPUT SPEEDED UP 30% by Armstrong trapping on each steam jacketed kettle.—*Bulman's Ltd., Vernon, B. C.*

ARMSTRONG STEAM TRAPS

HEATING AND VENTILATING

A MONTHLY MAGAZINE FOR ENGINEERS AND CONTRACTORS CONCERNED WITH THE DESIGN AND APPLICATION OF AIR CONDITIONING, REFRIGERATION, PIPING, AIR SANITATION, HEATING AND VENTILATION IN BUILDINGS

Editorial Staff

Editor
CLIFFORD STROCK

Associate Editors
NATHAN N. WOLPERT
WILLIAM B. FOXHALL

Advertising Staff

Western Representative
GEORGE G. TURNER
228 North La Salle Street
Chicago 1, Ill.

Eastern Representative
HARRY J. TWINE
148 Lafayette Street
New York 13, N. Y.

Pacific Coast Representative
ROBERT H. DEIBLER
2506 W. 8th Street
Los Angeles 5, Calif.

Published by

THE INDUSTRIAL PRESS
148 Lafayette Street
New York 13, N. Y.

President
ROBERT B. LUCHARS

Vice-President and Treasurer
EDGAR A. BECKER

Secretary and Publishing Manager
HAROLD L. GRAY

Subscription Rates

Yearly subscription in the United States and Canada, one year, $3; two years, $5; three years, $6; in all other countries, $5 per year. Single copies 30 cents. Entered as second-class matter, April 18, 1925, at the Post Office, New York, N. Y., under the act of March 3, 1879.

Member, Audit Bureau of Circulations.

CONTENTS FOR FEBRUARY, 1950

VOLUME 47 NUMBER 2

ARTICLES

Welding Stainless Steel Pipe 63
A. J. Ely, Jr.

Air Conditioning Design Data for Commercial Applications 68
N. N. Wolpert

Throttling Effects of Gate vs. Globe Valves 72
T. W. Reynolds

Controlled Conditions Featured in Refinery Shop 74

Sizing Expansion Tanks for Hot Water Heating Systems 87
G. P. Jankauskas

Estimating Water Discharge 89
J. D. Constance

What Happened at Dallas 91

Draftless Air Diffusion in Air Conditioning 93
W. H. McCaully

REFERENCE MATERIAL

Section—Piping for Fuel Oil Tanks and Fuel Oil Burners 75

Data Sheet—American Standard Graphical Symbols 86

DEPARTMENTS

Washington News—*Loring F. Overman* 59

Picture Paragraphs 67

Experience is my Classroom—*T. W. Reynolds* 86

News of Equipment and Materials 95

News of the Month 107

Abstracts and Reviews 112

Degree-Days for December, 1949 113

New Catalogs 116

Getting Personal 124

Since the Last Issue 124

Industrial Degree-Days for December, 1949 129

Canadian Degree-Days for December, 1949 130

Coming Events 130

The contents of HEATING AND VENTILATING are indexed monthly by Industrial Arts Index and by Engineering Index.

Copyright, 1950, by The Industrial Press

PUBLISHERS OF MACHINERY & MACHINERY'S HANDBOOK
The INDUSTRIAL PRESS

THIS MONTH'S COVER

Air conditioned comfort is provided in this Schrafft restaurant located in the Esso Building, Rockefeller Center, New York City. It is one of the newest in a chain of air conditioned restaurants operated by the Frank G. Shattuck Co., which supplied the photo.

Two great names join forces!

EFFECTIVE January 6, 1950, American Air Filter Company, Inc., Louisville, Kentucky, and The Herman Nelson Corporation, Moline, Ill., merged their interests, with the former company remaining as the surviving corporation.

Each organization will continue to operate from its respective headquarters, with present management and field representation.

In the future, industry may expect even still finer products and services from these two recognized leaders in the field of heating, ventilating, air filtering and dust control equipment.

American Air Filter Company, Inc.

LOUISVILLE 8, KENTUCKY • MOLINE, ILLINOIS

Washington News

LORING F. OVERMAN

ANY question as to whether Washington would attempt to continue its "spend and spend, and elect and elect" philosophy was dispelled during January when the President delivered to the 81st Congress three important messages.

First came the "State of the Union" message—revealing that things are so rosy that government spending plans might be safely based on an anticipated $300 billion national income within the foreseeable future.

Next came the budget message, proposing for the fiscal year beginning July 1, a total federal expenditure of $42.4 billion, anticipating revenues of $37.3 billion, and forecasting a deficit of $5.1 billion.

Third, after considerable delay, came the President's tax message, recommending the elimination of some excise taxes; cuts to be accompanied by increased revenues of approximately $1 billion to be derived primarily from plugging loopholes, revision of corporate tax rates, and higher levies on gifts and estates.

Congress Wary

That members of Congress from both parties are going to eye budget and tax proposals from the standpoint of what constituents want, as well as what the President wants, was immediately apparent. There were even hints that if the President and his advisors, like most members of Congress, had spent the recess period in the field instead of in D.C. and Key West, he might have some other ideas concerning how far the voters will go in rewarding with ballots the spend-more ideology.

From within the President's own party, some of the opposition was quite vocal. Chairman George (D., Ga.) of the Senate Finance Committee and Chairman Doughton (D., N.C.) of the House Ways and Means Committee, both object to the imposition of new taxes, and come out for balancing the budget by cutting expenditures.

The possibility of an in-party rift is further accentuated by the position taken by Speaker Sam Rayburn (D., Tex.), the Administration's chief lieutenant in the House. Speaker Rayburn said he would oppose the President's suggestion that in plugging tax loopholes, depletion allowances for oil and mining companies be reduced.

Loopholes Alleged

Under present income tax laws, companies which drill oil, or mine almost any kind of minerals enjoy special "depletion allowances" intended to assure recovery of their original investment before reserves are exhausted. These deductions range from 5% of gross income for sand and gravel production, to 27½% for oil wells, but may not exceed 50% of net income. The President said he "knew of no loophole in the tax laws so inequitable as the excessive exemptions now enjoyed by oil and mining interests." He contended that the percentage allowances far exceed investment costs.

In some quarters it is admitted that there may be abuse of the depletion allowance rates as applied to oil. On the other hand, these informants say, the production record of the oil industry during the last few years offers evidence that individual initiative can still produce the goods if given sufficient inducement. They further imply that if the Administration were as willing to encourage industry to expand and produce as it is to plug tax loopholes, the country would be better off.

Votewise Decisions

This being the year when the voter is boss for one-third of those in the Senate and all in the House, it will be interesting to note whether members of Congress take their direction from Blair House in Washington, or from Constituent House on Main street. Speaker Sam Rayburn's quick word of reassurance to the oil folks in his own state probably gives the tip-off as to how others will react.

Ah, but there's the rub. Although no member of Congress wants to be blamed for increasing taxes in an election year, neither does he want to risk "cutting off at the pockets" some constituent who might have to be sacrificed if the economy program became truly serious.

Strangely enough, the Administration has for many terms shown the ability to make such constituents believe that the tax portions of the program are reserved for someone other than himself, while the day-to-day benefits are his alone as long as he votes "thoughtfully."

1951 Vote-Getters

Included in the current budget are offerings intended to interest a widely varied clientele of voters, and to place the added tax burden where they would appear to do the least harm. Some of the proposals, if approved, would:

Increase patent fees.

Apply the 1½% tax on employer and employee to finance social security old-age insurance benefits to the first $4,800 of income instead of the first $3,000, as at present.

Authorize the RFC loan limit on prefabricated houses to be increased from $50 to $75 million.

Increase lending authority of Rural Electrification Administration by $400 million.

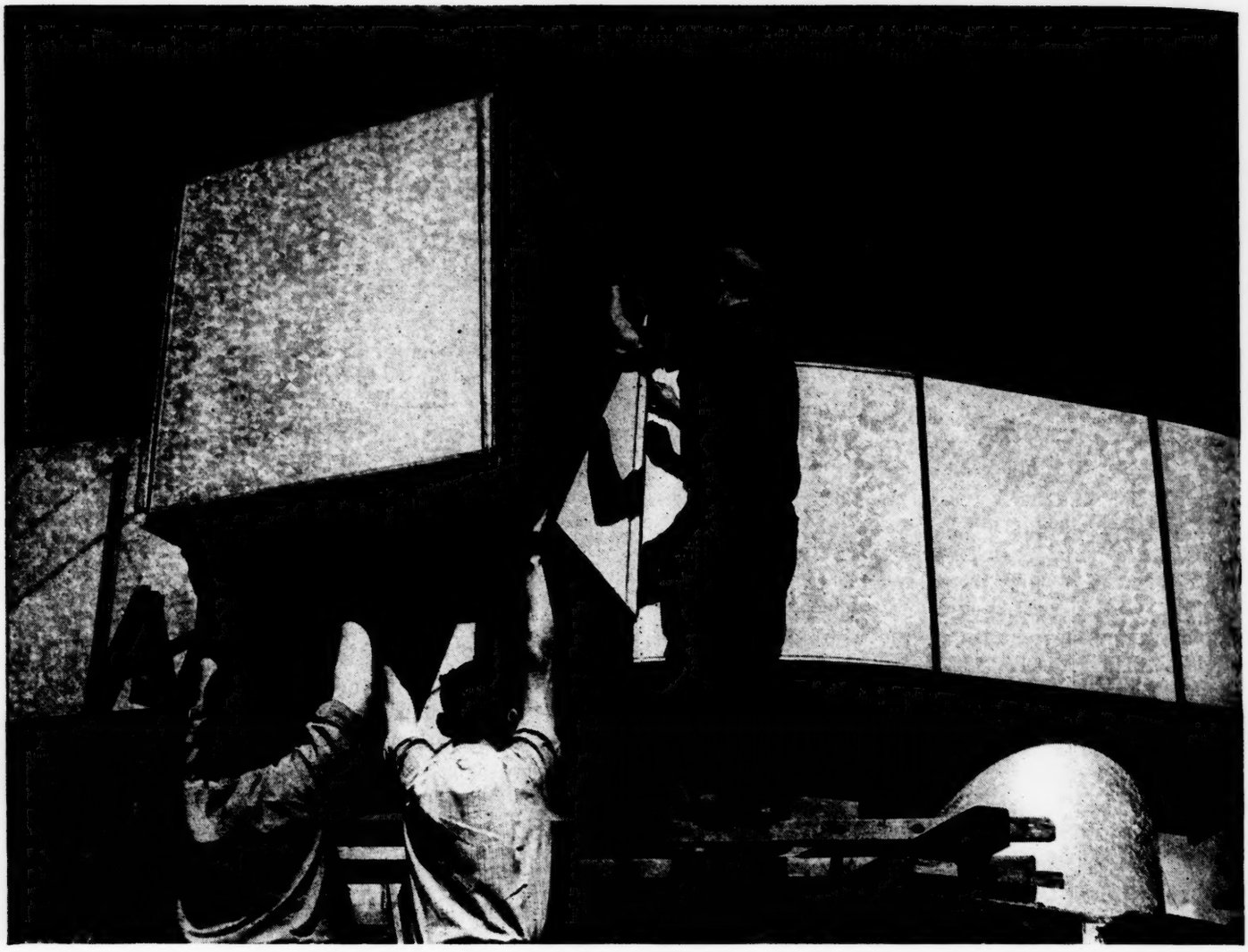
Authorize St. Lawrence Waterway and power project.

Provide annual federal-aid authorization for highways of $500 million for two years, an increase of $50 million annually.

Continue rent controls for another year.

Increase postal rates to yield an additional $395 million annually.

Approve Fair Employment Practice Commission and labor extension service.



More rust-resistance for your money in Beth-Cu-Loy Galvanized Sheets

(made from copper-bearing, open-hearth steel)

The base metal used in Beth-Cu-Loy Galvanized Sheets is open-hearth steel containing 0.20 to 0.30 pct copper. Atmospheric exposure tests in various localities show that steel of this composition outlasts ordinary steel and open-hearth iron.

In addition to this long-lasting base, a tight, uniform coating of Prime Western zinc gives Beth-Cu-Loy Galvanized Sheets double defense against corrosion.

Though you might expect sheet metal of this quality to be costly, actually Beth-Cu-Loy Galvanized Sheets are priced at little more than ordinary galvanized sheets. This small difference in price is returned many times over in longer service and greater satisfaction to the customer.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

Beth-Cu-Loy Galvanized Sheets

BETHLEHEM STEEL

Revise the government's minimum standards under the unemployment compensation program. The new standards would require that a single person be paid 50% of his previous wage up to $30 weekly, and that additional amounts up to a maximum of $48 weekly be paid to married men with families. These payments would extend over a minimum period of 26 weeks. (A large number of "voters" may see in this proposal a means of working 26 weeks and remaining unemployed for an equal period under conditions not too bad.)

Watchdog Group Formed

Undaunted by past evidence that votes grow best when irrigated by federal funds, an economy drive with some bipartisan aspects is bravely starting. House Republican Leader Martin has named Representative John Taber (R., N.Y.), ranking GOP member of the House Appropriations Committee, to lead a special watchdog group on proposed federal spending.

This group will prepare and publicize reports on estimated costs of all major spending bills proposed in the house. These reports will be used by economy leaders to stimulate interest throughout the country in their cause. Chairman Cannon (D., Mo.) of the House Appropriations Committee has also announced that it will be the objective of his committee to keep spending within estimated income.

Thus there is the possibility that the economy movement—whether gesture or actuality—may create serious roadblocks for such Administration recommendations as federal aid-to-education, multimillion dollar housing subsidies to middle-income groups, public power expansion, and some proposed increases in aid to states.

Short Session Possible

Being preoccupied with the idea of getting home to electioneer, it is likely that members of Congress will skip lightly over some other issues, without action. Included among those in the "deferred" file are proposed revisions of the Taft-Hartley Act, the Brannan plan for subsidizing farm crops, and the compulsory health insurance plan. All of these, they admit, will make good campaign issues.

Where's Business?

Although every member of the heating, ventilating and air conditioning fraternity can and should have a part in seeing that Congress does right by our country, of equal concern is the question of where to find business in 1951.

A good place to look, it would appear, is in the health and educational fields. Construction of hospitals and schools will amount to approximately 45% of the total of $4.5 billion projected for all non-residential building in 1950. Social and recreational buildings are also expected to be ahead of 1949.

Late in 1949 the Congress passed S.614 amending the 1947 Hospital Survey and Construction Act and providing for $75 million annually in addition to a similar provision in the 1947 legislation to be spent for hospital construction. Including matching funds to be provided locally, it is expected that the combined annual total for hospital construction put to work by these two laws will amount to approximately $425 million for each of the next five years. This sum is in addition to hospital construction that will be accomplished without federal aid. An annual total of $855 million is anticipated if privately financed projects are included.

Hospital surveys completed in 1948 indicated a new and replacement need of hospital facilities amounting to 860,000 beds. At prices current when that study was completed, it would have cost $9 billion to bring the hospital plant of the nation into line with the immediate need. Even though decreasing building costs may scale this down to as little as $7.5 billion, only a little more than 10% has been completed in the past two years. Also, in the original estimate, no provision was made for population growth or for further obsolescence of existing facilities.

This factor of lag far behind well known and established need makes it highly probable that construction will proceed as rapidly as funds are made available.

Conditions in educational construction look equally hopeful for a substantial increase in 1950. In this classification, also, the curve of building expenditures has gone steadily upward over a two-year period, the 10-month total for 1949 having reached $904 million, a gain of 44% over the $626 million during the corresponding period of 1948.

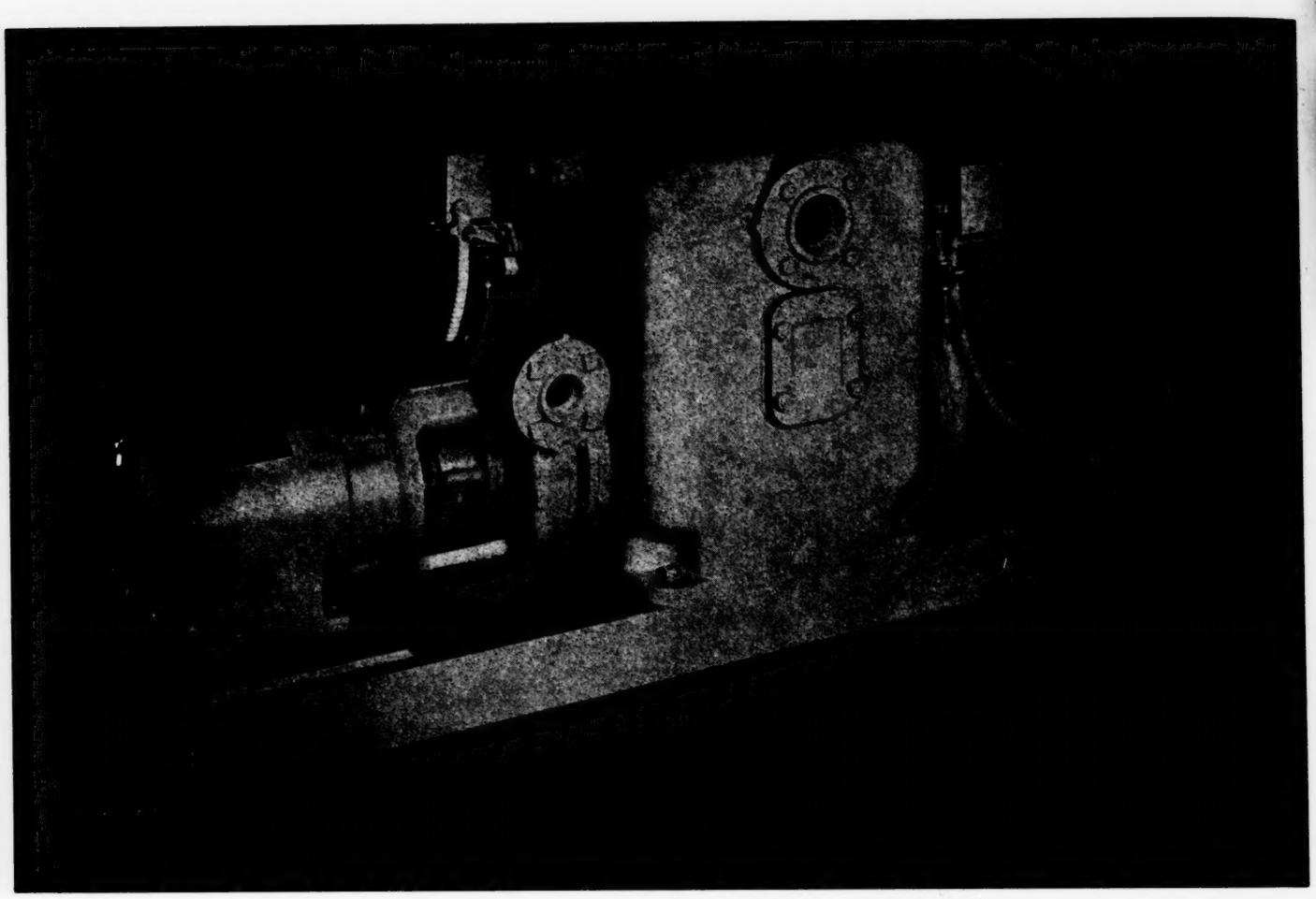
In early 1948 the U. S. Office of Education estimated a $6.6 billion need for additions to the public elementary and secondary school plant, and a need for $3.5 billion for additions and replacements of college and university facilities. From 1932 through 1947 there was a $5 billion lag in public school construction and in January, 1948, it was estimated that elementary and secondary school enrollment would increase by 6,300,000 pupils by 1955.

Although present estimates of college enrollment by 1960 are for a leveling off somewhere below the 4 million indicated by estimates a year ago, the physical plant for higher education is still far behind present and anticipated needs.

Those serving the transportation field will have less to look forward to in 1950, the Office of Domestic Commerce indicates. In the railway passenger car field, orders for 1950 are estimated at a total of 275. Although this is an increase of 90% over 1948, when 145 cars were ordered, the expected total is dwarfed by the 1947 figure of 517 cars. Diesel electric units show the only gain in the field, with 2,500 ordered for 1950, as against 1,600 in 1949. The trend from steam to Diesel is indicated by the fact that only 65 steam locomotives were ordered in 1949.

It is estimated that a total of some 682,000 gross tons of shipping, excluding naval vessels, will be completed in United States yards in 1950. In 1949 the industry completed 225 vessels comprising approximately 77,000 tons. Because of a higher cost of building ships in the United States than abroad, it is not expected that domestic building for foreign owners will be of any consequence during the foreseeable future. Shipyards abroad are now in a position to accept practically all new construction orders offered.

MAXIMUM EFFICIENCY FOR STEAM HEATING SYSTEMS ON HEATING, DRYING AND PROCESS WORK.



JENNINGS CONDENSATION PUMPS

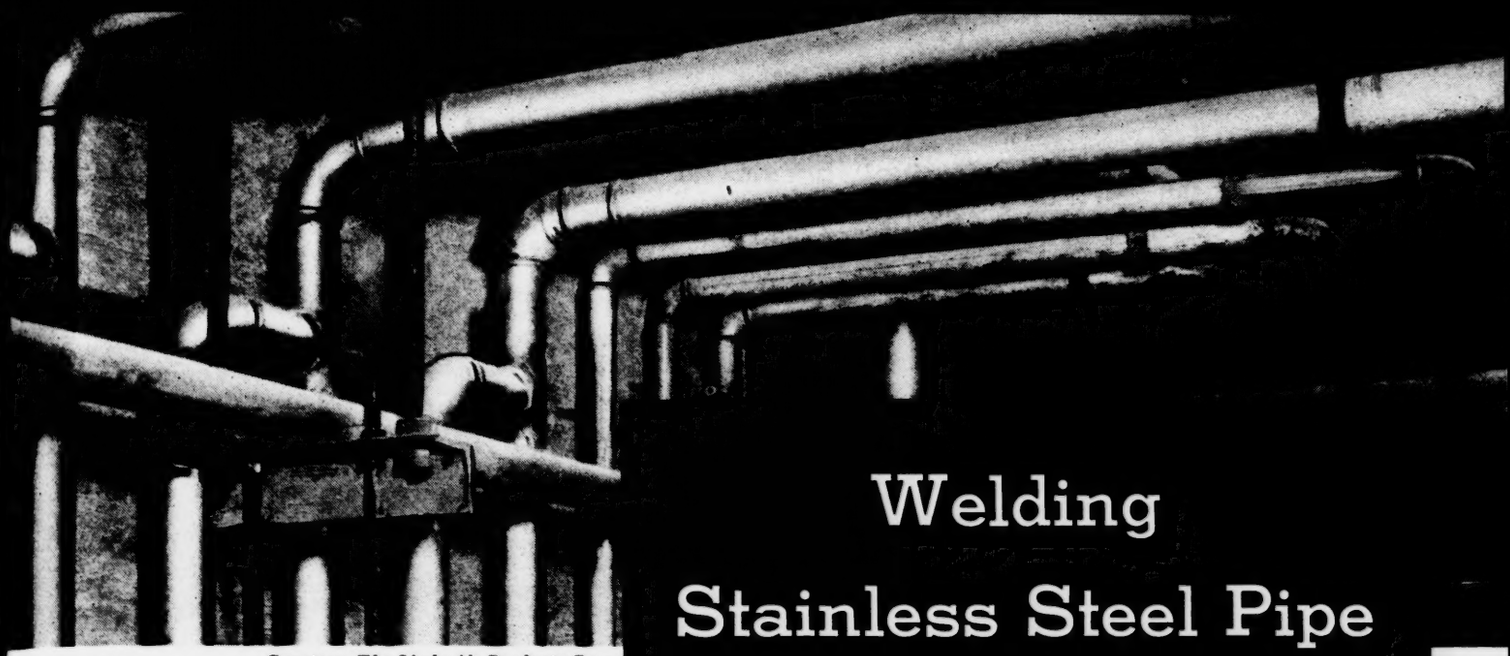
Designed for steam systems on heating, drying, or process work, these pumps offer the most reliable and efficient means of returning hot condensate to boiler or hot well. In many cases these pumps will save costly installation of boilers in a pit to provide gravity flow of returns from basement radiators and heating devices.

The Jennings Condensation Pumps are sturdy and compact in construction, and combine receiving tank, pump and driving motor in a single assembly. Pumps are bronze fitted throughout, with tobin bronze shaft. The pumping impeller is of special design, made possible by our wide experience with return line heating pumps, and is especially adapted for handling hot water with the greatest possible efficiency.

Full automatic control is furnished by means of a ball float and float switch mechanism mounted on the receiving tank. All wiring is made up at the factory, and it is necessary only to connect the pump to the system and hook up the leads. Complete information regarding these economical pumps sent promptly on request.

THE NASH ENGINEERING COMPANY

SOUTH NORWALK, CONNECTICUT, U. S. A.



Courtesy, The Linde Air Products Co.

Welding Stainless Steel Pipe

ALLEN J. ELY, JR.
Taylor Forge & Pipe Works, Chicago, Ill.

Part 1 of a two-part article covering basic information regarding the welding of stainless steel pipe and factors to be considered.

THE growing use of stainless steel piping is a concept that by this time is accepted and is no longer worthy of special comment. Each year finds more stainless piping systems being installed for industrial applications, particularly in the process industries. This greater number of stainless installations is bringing to light problems peculiar to a stainless steel piping fabrication which warrant comment.

Management's Point of View

It is important to have a basic working knowledge of the stainless steels, three of which will usually suffice for the large majority of stainless installations —type 304, type 347, and type 316, in ascending order of their relative cost. It is sufficient to say for the present that type 304 is the basic 18% chromium, 8% nickel austenitic stainless steel; that type 347 is 18-8 stainless stabilized with columbium; and that type 316 is the basic 18-8 stainless with 2% molybdenum added.

Generally speaking, relative raw piping costs for 304, 347, and 316 are in the ratio of 100 - 125 - 166. Obviously, it is not advisable to use the more expensive type 316 when one of the less costly grades will do the job equally well. Consequently, before any decision is reached, all applicable data should be examined carefully. Probably the best data sources are the stainless steel producers themselves. All of them provide valuable consultation services to help in the selection of the stainless type most appropriate.

It is necessary to determine the best type of joint to be used. Here the important criterion is whether or not the joint leaves any groove or crevice on the interior surface of the piping. Any such pocket serves as a focal point for "concentration cell corrosion." By this measuring stick, an ideal piping system would incorporate butt-welded joints to the maximum possible, and flanged joints having square internal corners, wherever necessary to dismantle the piping into convenient units.

The quality of welding in any installation will considerably influence its corrosion-resistant properties. Stainless steels are susceptible to a peculiar phenomenon known as carbide precipitation when heated to temperatures between 800 and 1,600F. Carbide precipitation reduces corrosion resistance by depleting the chromium content in the grain boundaries, and since the welding zone is subjected to the critical temperature range, carbide precipitation becomes an important factor whenever welding is involved.

While stainless steel can be welded by most commercial processes, the physical properties of stainless make some processes considerably more adaptable than others. Arc-welding in some form is most commonly used with stainless piping. It should be noted that not all contractors are equipped to weld with some of the newer processes now coming into increased favor for welding stainless, a factor having considerable bearing on the choice of a welding process and a contractor. And since the quality of welding to a large extent controls the degree of corrosion resistance of stainless piping, the process and the techniques to be used are important enough to rate careful consideration.

The first cost of a stainless steel installation is usually a substantial figure, and since pipe is its more expensive constituent, it has received a great deal of scrutiny. After a great deal of consideration by users, fabricators, manufacturers, and stainless pipe producers, the American Standards Association established a new, lighter series of wall thicknesses for stainless steel pipe known as Schedule 10 S. This new schedule pipe weighs approximately 50% less per foot than standard wall pipe (Schedule 40 S) yet it is heavy enough to retain adequate stiffness and

TABLE 1—PHYSICAL AND CHEMICAL SPECIFICATIONS FOR COMMONLY USED STAINLESS STEELS

Chemical and Physical Properties	Pipe and Welding Fittings			Forged Flanges		
	Type 304; or A 312* Grade TP 304	Type 347; or A 312* Grade TP 347	Type 316; or A 312* Grade TP 316	Type 304; or A 182* Grade F 8	Type 347; or A 182* Grade F 8 c	Type 316; or A 182* Grade F 8 m
Carbon, max. %	0.08	0.08	0.08	0.08	0.08	0.08
Manganese, max. %	2.00	2.00	2.00	2.00	2.00	2.00
Phosphorus, max. %	0.03	0.03	0.03	0.040	0.040	0.040
Sulfur, max. %	0.03	0.03	0.03	0.030	0.030	0.030
Silicon, max. %	0.75	0.75	0.75	1.00	1.00	1.00
Nickel, %	8.00—11.00	9.00—13.00	11.00—14.00	8.00—11.00	9.00—12.00	10.00—14.00
Chromium, %	18.00—20.00	17.00—20.00	16.00—18.00	18.00—20.00	17.00—19.00	16.00—18.00
Molybdenum, %	.....	.....	2.00— 3.00	.....	.....	2.00— 3.00
Columbium, %	.....	8 x carbon; 1.00 max.	.....	.....	8 x carbon; 1.00 max.	.....
Tensile strength—min, lb per sq in.	75,000	75,000	75,000	75,000	75,000	75,000
Yield point—min, lb per sq in.	30,000	30,000	30,000	30,000	30,000	30,000
Elongation in 2 in.—min, %	35	35	35	45	45	45
Reduction in area—min, %	.....	.....	.....	50	50	50

*ASTM designation.

rigidity. It has the added advantage of retaining the IPS system of outside diameters, thereby making standard valves, fittings and miscellaneous fixtures completely interchangeable and adaptable. New stainless piping installations should be examined carefully in the design stages to insure maximum use of Schedule 10 S pipe and fittings since they do permit substantial reductions in material and fabrication costs.

The Contractor's Point of View

The contractor's chief purpose is to translate management's plans and specifications into a sound piping system at a profit. This requires the same well-grounded knowledge of the fundamentals of stainless steel piping, including its practical aspects. In some cases he may have broader experience with stainless piping than does management. Here the contractor can make himself doubly valuable by giving management the full benefit of his knowhow.

Although management may specify which welding process is to be used, the actual welding is the contractor's own problem. He must recognize that welding stainless steel is an exacting process, one which requires constant close controls if good results are to be obtained. Regardless of which process is used, special precautions must be taken to insure cleanliness, consistent and standardized welding procedures, and good overall welding techniques. The contractor usually finds that shop fabrication, to the maximum extent possible, helps toward best end results. The wider range of welding processes available, better and cleaner working conditions, and better heat treating facilities, all help to promote the best final quality.

The important thing to remember is that a stainless steel piping system represents a considerable investment, one that in most cases can only be justified on the grounds of longer service or a better and purer product flowing out of the system.

Types of Stainless Steel

It is obvious that an intelligent decision as to which type of stainless steel to use requires a rather thorough knowledge of the basic properties of the more commonly used stainless steels. Table 1 gives the specific chemical and physical properties for all three types. While these represent the basic types, there are two important modifications. Type 304, with a maximum carbon content of 0.03%, is currently in the process of development as a substitute for type 347 because the present-day government policy of stockpiling columbium has greatly limited the supply available for industrial use. Stainless steel with very low carbon tends to prevent the carbide precipitation for which columbium is added. Type 316 with columbium added (unofficially known as type 318), and type 316 with 0.03% maximum carbon, also finds use where moly is needed and where harmful carbide precipitation must be prevented.

What do we mean by carbide precipitation and by stabilization? Carbide precipitation is a peculiar phenomenon which occurs when chrome-nickel stainless steels are heated between 800 and 1,600F. In this range, chromium carbide is precipitated to grain boundaries depleting the supply of corrosion-resistant chromium at the boundaries and paving the way for intergranular attack. This harmful precipitation can be prevented in two ways. One way is by use of a stabilized stainless steel. By "stabilized" we mean one to which columbium, at least ten times the carbon content, has been added (type 347 or type 318). What effect does this stabilization have? Columbium has a greater affinity for carbon than chromium. Thus when precipitation occurs it is in the form of columbium carbide which is not harmful since virtually all the chromium remains available to resist corrosion.

The second way to combat harmful carbide precipitation is to restrict the amount of carbon in the stain-

less steel. Austenitic stainless steels will retain about 0.02% carbon in solid solution no matter how long exposed to the critical 800—1,600F range. Now that columbium is available in restricted quantities only, stainless steels are being produced with 0.03% maximum carbon. Having very little carbon available for precipitation, these grades are becoming increasingly prominent as substitutes for those stabilized with columbium.

This question of carbide precipitation is naturally very important where service temperatures are in the critical 800—1,600F range. However, much stainless piping is not subject to high operating temperatures and pressure, corrosion being the chief justification for using stainless steel. For these applications, carbide precipitation becomes of vital interest whenever stainless steel pipe is welded, since a considerable zone adjacent to the weld is held in the 800—1,600F range for varying lengths of time. If carbide precipitation takes place, an area of low corrosion resistance is created—a very undesirable condition. Consequently, where service conditions indicate that maximum resistance to corrosion is essential, that carbide precipitation must be kept at a minimum, a stabilized material or an ELC (extra low carbon) grade should be used unless the entire piping assembly can be heat treated. Where heat treating of entire pipe assemblies is feasible after fabrication, unstabilized and normal carbon grades of stainless can be used since annealing puts the precipitated carbides back in solid solution. If adequate heat treating facilities are available, consideration should be given to fabricating the piping from the less expensive unstabilized grades and removing carbide precipitation effects after welding.

It is important to note that neither columbium stabilized or ELC grades are perfect inhibitors of carbide precipitation. Thus care should be exercised to prevent prolonged exposure of any austenitic stainless steel, whether stabilized or low carbon or neither, to the 800—1,600F critical range. This precaution will be discussed further.

Type of Joint

There are many means of joining stainless steel pipe lengths to fittings, valves, pumps, and other piping fixtures. These include flanged, butt-welded, socket-welded, threaded, and brazed joints. All have been used in existing stainless piping installations. Some have special advantages for specific applications; many have decided disadvantages.

When stainless piping is used to eliminate corrosion or to insure purity of the fluid piped, it is imperative that there be no internal cracks or crevices in the system. Readily apparent as a purity precaution, the need to eliminate crevices to prevent corrosion is not quite so obvious. Crevice corrosion is also known as concentration cell corrosion and takes one of two forms: (1) metal-ion cell corrosion and (2) oxygen-cell corrosion. The two are closely related, both being electro-chemical reactions occurring when one metal is surrounded by the same fluid in varying concentrations.

Metal-ion corrosion occurs when a metal, stainless steel in our case, is surrounded by a fluid of two metal-ion concentrations. For example, fluid entrapped in a crevice normally has a higher metal-ion concentration than the flowing fluid. A minute current is thus set up from the low to the high concentration, resulting in pitting in the low metal-ion area. Oxygen-cells cause corrosion similarly but more or less in reverse.

Crevices are to be avoided to the maximum extent possible. Examining our list of available pipe joints we find that threaded, socket-welded, brazed, and some flanged joints all have cracks or crevices exposed in one form or another. In certain fields, notably the dairy product industries, flanged and threaded joints are used to join each length of stainless steel pipe. Here the resultant crevices are of minor import, because the entire piping system is completely disassembled at frequent regular intervals for sterilization and inspection. In most other fields, where the intent is to make the installation permanent, it becomes imperative to make the piping system completely free of crevices.

When brazed and socket-welded joints are used, it is never possible to completely eliminate the crevice between the butting ends of the pipe or fittings. It consequently becomes apparent that the only certain means to insure lack of cracks and crevices is to use butt-welded joints to the maximum extent practical. Where flanged joints are required, they should be of the butt-weld type using either lap joint stub ends or butt-welding flanges. Slip-on, threaded, and socket-welding flanges are to be avoided. The combination of the maximum number of butt-welds with the minimum number of butt-welded flanged joints necessary to permit breaking the piping into convenient, accessible units, results in a system which is bottle-tight, free from harmful crevices, and destined for a long service life. It should be noted, however, that butt-welds with full penetration are essential to avoid crevices, and that penetration must be achieved without the aid of welding rings which would create stagnant pockets.

The author's company has developed two new economical methods for providing butt-welded flanged joints which, when used with butt-welded pipe joints, provide a crevice-free piping system.

The first is a stainless lap joint steel stub end, forged integrally in one piece, Fig. 1, which has a heavy lap

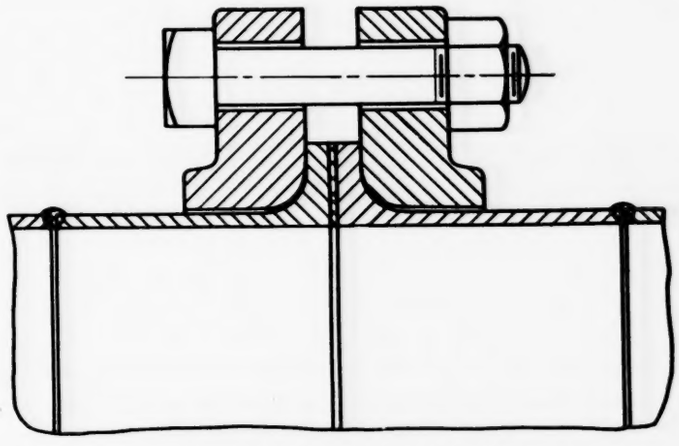


Fig. 1. Taylor Forge short lap joint stub end used with 150 lb ASA lap joint flanges.

and a square inside corner. This stub end is normally used in conjunction with standard ASA carbon steel lap joint flanges, thereby effecting considerable savings. Also, the stub ends are made shorter than is customary, resulting in additional savings. It should

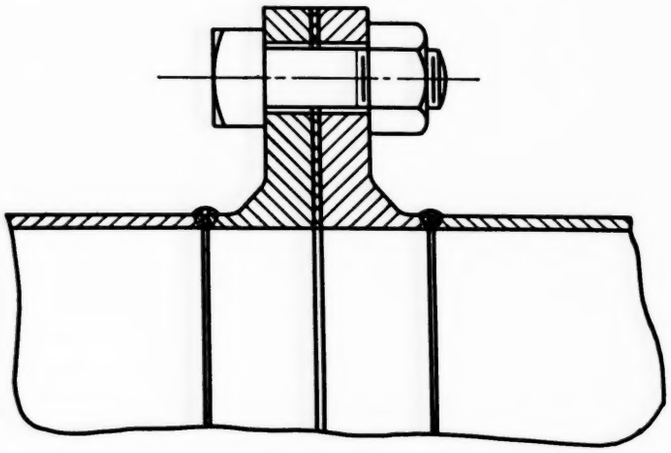


Fig. 2. Taylor Forge lightweight butt-welding flange.

be noted, however, that these short stub ends are still long enough to be used with 600 lb ASA flanges without having the flange hub cover the butt-weld.

The other development, Fig. 2, is a lightweight butt-welding flange forged from stainless steel. This flange also has a square inside corner and is flat faced for use with a full-face gasket. The drilling matches the ASA 150 lb standard, but the flange itself is considerably lighter than standard ASA flanges, making them very economical. The design of these flanges has been adapted from similar carbon steel flanges which have been used extensively for many years with lightweight steel pipe. These 150 lb corrosion-resistant standard butt-welding flanges are rated at 150 lb per sq in. at 400F and 200 lb per sq in. at 100F.

It will be recalled that the optimum stainless steel piping system contains butt-welded joints to the maximum extent feasible, but that where necessity dictates that piping must be broken, flanged joints which do not create pockets and crevices should be used.

Joint Design

The question of stainless steel welding bevels has not been fully answered to date, but progress is being made toward eventual standardization. Taylor Forge and Pipe Works recently conducted an informal survey among the nation's largest consumers and fabricators of stainless piping to ascertain their thinking regarding when bevels are necessary and when they are not. Surprisingly enough, their replies indicated a widespread area of agreement. It is pleasant to report that general preference exists for square ends in thicknesses up to ⅛ inch, and for standard 37½ deg ASA bevels on all heavier wall thicknesses. Most of those queried assumed the use of d-c arc welding. Many reported that when inert-arc welding was used, satisfactory butt-welds could readily be made with square ends on thicknesses up through ¼ inch.

Stainless steel piping has risen to prominence so rapidly, that until recently the field has had the benefit of little or no standardization. Obviously the relatively high first cost of stainless materials has been still further increased by this lack of uniformity, a situation which has stimulated considerable thinking on the part of all parties interested in stainless steel piping. The result is ASA B36.19, the new standard for stainless steel pipe which covers the dimensions of stainless steel pipe in sizes from ⅛ through 12-inch. It establishes Schedule 40 S and Schedule 80 S which have the same wall thickness as standard wall and extra strong wall carbon steel pipe, respectively. Recognizing the demand for a more economical lightweight stainless steel pipe standard, subcommittee B36 of ASA has conceived a new system of wall thicknesses known as Schedule 10 S. While retaining all the advantages of the iron pipe size O.D. dimensions, Schedule 10 S provides a lighter and consequently more economical series of pipe dimensions for those services where the heavier walls of Schedule 40 S and Schedule 80 S are not needed for pressure reasons. Savings in weight of the magnitude of 40—50% over Schedule 40 S are realized, yet pipe rigidity is not sacrificed. See Table 2. For most corrosion service applications, Schedule 10 S piping will provide the most satisfactory and economical answer.

Preliminaries to Welding

After deciding on butt-welded joints wherever practicable, the problem becomes one of how to insure sound welds with full penetration at the same time avoiding harmful carbide precipitation.

First let us compare the physical properties of stainless steel to those of carbon steel. There is considerable variance in the specific properties affecting welding. The coefficient of expansion of stainless steel is approximately 50% greater than carbon steel, heat conductivity is less than half that of carbon steel, and electrical resistance in the annealed state is about six times as great as carbon steel. The austenitic stainless steels also have a slightly lower melting point.

The effect of these important differences will be evident to the experienced welder. The high coefficient of expansion tends to cause distortion, a condition furthered by the low heat conductivity which means that a comparatively small zone reaches a much higher temperature than its adjacent area. The high electrical resistance makes the use of electric current for welding quite desirable since heat can easily be con-

TABLE 2—WEIGHT COMPARISON OF 90-DEGREE LONG RADIUS WELDELLS

Schedule 40 S and Schedule 10 S

Pipe Size, Inches	Weight in Pounds		Weight Saved, Per Cent
	Schedule 40 S	Schedule 10 S	
1	0.33	0.27	18.2
2	1.44	1.03	28.5
4	8.38	4.33	48.3
6	24.41	10.85	55.5
8	116.64	56.80	51.5

centrated on a desired spot. In this respect, the low heat conductivity of stainless steel is a decided advantage since it tends to limit the area exposed to the critical carbide precipitation temperatures.

Stainless steel, particularly stainless steel that is used for anti-corrosion and product purity applications, must not become contaminated if it is to render the service for which it is selected. Surface contaminations probably cause the most trouble. In particular, contact with anything that could cause stainless to absorb carbon is undesirable. Oil and grease should be kept clear of stainless steel. No contact with carbon steel should be permitted as embedded particles of carbon steel serve as focal points for galvanic action. Conveyor trucks, work benches, tools—all are potential sources of contamination. They either should be stainless steel or should offer protection in the form of wooden skids and working surfaces. Grinding wheels should be restricted for stainless use only. Wire brushes should be made from stainless steel. Also, care should be exercised to prevent deep scratches and cracks during fabrication.

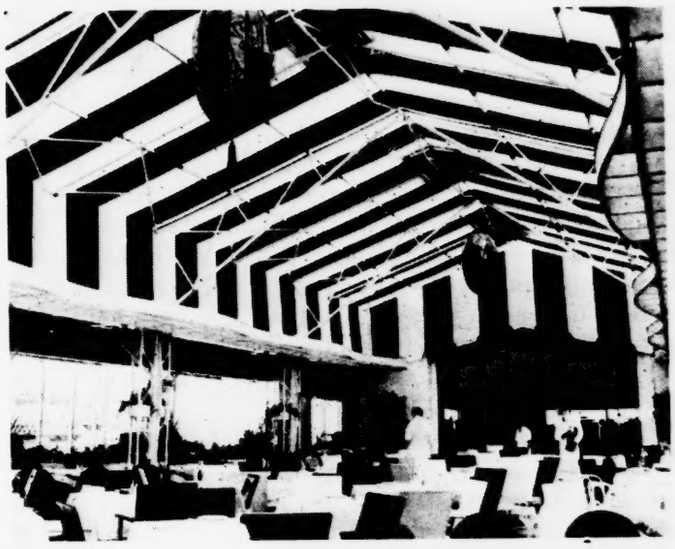
Cleanliness and special care will pay dividends in longer service, increased reliability, less maintenance. Failure to observe proper precautions can result in breakdown long before the design life of an installation is reached. A little extra care in fabrication saves many extra dollars.

The cutting of stainless steel pipe differs considerably from normal carbon steel practice. Ordinary oxy-acetylene flame cutting is not applicable to stainless. The most widely used, and generally the best procedure, is mechanical cutting, since it leaves a clean edge. Lately two other methods have been developed: (1) a special gas-cutting process which utilizes a fine powder that is fed into the oxygen stream, and (2) the oxy-arc process which uses a hollow coated electrode through which a supply of oxygen is fed. Both have the disadvantage that further conditioning is required after cutting before the edge can be suitably welded.

Part 2 of this article, to be published next month, will cover the various processes for welding stainless steel pipe.

Picture Paragraphs

(Above) Sharp cuts in time off due to colds, and a considerably improved office atmosphere is reported resulting from the operation of a Teg air treatment unit in the Johnstown, Pa., general offices of The National Radiator Co. The conditioning unit, seen at the far right in the above illustration, has filters which are continually washed with a solution of triethylene glycol and water.



(Abcve right) Radiant heat from the floor of Star Lite Gardens stretches the seasons for guests of Hotel Utah at Salt Lake City, although the roof garden is covered only by a canopy. The canopy is often rolled back so guests may dine and dance under the stars. Radiant heating plans specified wrought iron pipe coils in a cement slab floor.

(Right) Air as pure as modern science can make it is ensured office workers at the Western Crown Cork & Seal Corporation's new plant at San Francisco, Calif., as the result of an extensive installation of Westinghouse Sterilamps in the air ducts. A total of 92 Sterilamps irradiate 30,000 cfm in three air ducts. Tests have shown that such a battery of Sterilamps will kill approximately 99.5% of all air-borne bacteria passing within their effective range.

Air Conditioning Design Data for Commercial Applications

NATHAN N. WOLPERT
Associate Editor, Heating and Ventilating

Resume of the design conditions to follow for a number of commercial air conditioning applications.

LOOK about you in the business section of your city or community. You will find restaurants, banks, department stores, motion picture theaters, dentists' offices and food stores. If they are air conditioned, they all come under the general heading of commercial installations. They were prompted by the desire to provide personal comfort, as being distinguished from industrial air conditioning which has the responsibility of supplying conditioned air to make some production process possible, to increase production, or to improve the quality of some manufactured product.

There has been considerable advance in the number of commercial air conditioning applications for two main reasons:

(1) To meet competitive conditions in the same field.
(2) To satisfy the urgings of trade labor unions.

The air conditioning system may be something as simple as a small packaged unit serving a small retail store, or it may be something as complex as a central system to cool a motion picture theater. Each system is designed to meet the special conditions of temperature and humidity found most suitable for each individual application. It is, therefore, the purpose of this article to present design information for a number of the more common commercial applications.

Banks

Packaged air conditioning systems are commonly employed for offices in country locations, while the central system is installed in the larger city banks. An effort is made to maintain a 15 to 20F differential between inside and outside temperatures, and to hold the relative humidity at 40 to 50%. Cleanable oil filters are favored.

Bakeries

According to one baking authority, there are very few air conditioning installations in retail bakery salesrooms.

The higher humidity resulting from the washed air has a somewhat deleterious effect on the retail type of bakery product—the crisp crust of freshly baked bread, pies and sweet goods is lost. In addition, icings on cakes do not hold up well if subjected to moisture.

All this would be different were bakers educated to the possibilities of a dehumidifier.

Where air conditioning is employed, it is chiefly to better the morale of the salesgirls, and the following design conditions are common: Temperature between 70 to 80F and relative humidity between the limits of 45% and 60%.

Buses

Buses that operate interstate or for long trips are generally air conditioned. To meet travel standards established for coach travel on many railroads, an increasing number of air conditioned motor coaches or buses are being placed in service for the long runs.

While some of the modern bus air conditioning systems have very elaborate temperature control equipment, operated with a definite differential as against outside conditions, and even employing reheat and humidity control, other buses use nothing more than a simple thermostat for turning the air conditioning system on or off. It is believed that neither of these two systems is thoroughly satisfactory. The elaborate system is too complicated and too costly and also is too prone to give trouble. The simple system has the characteristic humidity rise during the off periods. However, the trend is toward greater simplification of controls.

It is difficult to set comfort standards for motor coach air conditioning for, due to the sun effect through windows, the proper answer has not been found. As compared with conventional stationary practice, the perfect air distribution system has not been found.

In order to establish definite design conditions, it is good to employ inside design optimum conditions of 76 to 78F D.B., and from 50 to 60% R.H.

It is not advisable to establish specific inside-outside temperature conditions because of change in ambients and the resulting apparent loss in passenger comfort. Due to heat reflection from a sun-baked highway, air entering the condenser coil is often 110F. Filters are always used, mainly to protect the cooling coils from clogging by lint from upholstery and clothing.

Commercial Applications

While this article covers a number of special commercial applications, it is safe to group the others not specifically mentioned under this general heading. The various trade unions are credited with forcing the general use of air conditioning in a number of commercial fields.

At one time there was a tendency to design all commercial air conditioning installations for 80F and 50% R.H., and to assume design conditions for southeast and southwest locations at 78F and 50% R.H. The present practice is to drop the temperature to 78F.

TABLE 1—RECOMMENDED SUMMER INSIDE DESIGN CONDITIONS*

Location—General Description	Typical Outdoor Design Conditions, Deg F		Continuous Occupancy								Transient Occupancy			
			Optimum Conditions				Commercial Maximum Conditions				Commercial Maximum Conditions			
	Dry Bulb	Wet Bulb	ET	DB Deg F	WB Deg F	RH %	ET	DB Deg F	WB Deg F	RH %	ET	DB Deg F	WB Deg F	RH %
	93	75	70	77	59.7	35	73	81	62.7	35	74	82	65.1	40
Northern				76	60.5	40		80	65.2	45		81	66.0	45
United States				75	62.7	50		79	66.0	50		80	66.7	50
at Sea Level				74	64.4	60		78	66.5	55		79	68.8	60
	95	78	71	78	62.0	40	74	82	65.1	40	75	83	65.9	40
Central				77	62.8	45		81	66.0	45		82	66.8	45
United States				76	64.9	55		80	66.7	50		81	69.1	55
at Sea Level				75	65.3	60		79	68.8	60		80	69.7	60
Southern	95	80	72	79	62.8	40	75	83	65.9	40	76	85	67.4	40
United States				78	63.5	45		82	66.8	45		84	68.3	45
Coastal Region				77	65.7	55		81	69.1	55		83	69.2	50
at Sea Level				76	66.2	60		80	69.7	60		82	69.8	55
North Pacific	85	65	68	74	59.0	40	70	77	59.7	35	71	78	62.0	40
Coast, United				73	59.6	45		76	60.5	40		77	62.8	45
States, at				72	61.4	55		75	62.7	50		76	64.9	55
Sea Level				71	61.8	60		74	64.4	60		75	65.3	60
South Pacific	90	70	69	76	57.3	30	71	78	62.0	40	72	79	62.8	40
Coast, United				75	59.7	40		77	62.8	45		78	63.5	45
States, at				74	61.8	50		76	64.9	55		77	65.7	55
Sea Level				73	63.4	60		75	65.3	60		76	66.2	60
	110	75	72	79	62.8	40	75	83	65.9	40	76	85	67.4	40
Desert Region				78	63.5	45		82	66.8	45		84	68.3	45
at Sea Level				77	65.7	55		81	69.1	55		83	69.2	50
				76	66.2	60		80	69.7	60		82	69.8	55
	95	70	69	76	57.3	30	72	79	62.8	40	73	81	62.7	35
Mountain				75	59.7	40		78	63.5	45		80	65.2	45
3,000 to 7,000				74	60.4	45		77	65.7	55		79	65.8	50
Ft Elevation				73	62.3	55		76	66.2	60		78	66.5	55
Tropical,	90	80	72	79	62.8	40	75	83	65.9	40	76	85	67.4	40
Subtropical and	to			78	63.5	45		82	66.8	45		84	68 3	45
Equatorial	100			77	65.7	55		81	69.1	55		83	69.2	50
at Sea Level				76	66.2	60		80	69.7	60		82	69.8	55

*Table prepared by Carrier Corp., Syracuse, N. Y.

Where the system is located in a wide dust area, with dust being liberated by some nearby industry or present from other causes, special treatment for dust removal may be indicated. Although electrostatic filters have proven satisfactory for such special treatment, most of the filters now being used are of the throwaway type. It has been found that as the owner becomes better acquainted with the benefits resulting from air filters, he is more inclined to add to the square feet of filters in his air conditioning system.

At one time, good business practice was served if an air conditioning system were installed. Now, due to competition from similar stores in the field, it is considered sound business to install the best air conditioning system that the purchaser can afford.

In Table 1 (prepared by Carrier Corp.) are listed recommended summer inside design conditions for many geographical sections and for various dry and wet bulb conditions for specific ET or effective temperature values. It also gives data for continuous and transient occupancy. The latter is defined as occupancy of less than one-half hour.

Dentists' Offices

Air conditioning in dentists' offices not only promotes the comfort of the patients, but it increases the efficiency of the dental operators. Unpleasant temperature and humidity conditions greatly multiply the discomfort suffered from the simplest form of dental operation.

Several materials that are commonly used, such as zinc oxide cements, silicates, and various impression materials, are more or less affected by temperature and humidity conditions in their manipulation. Air conditioning stabilizes the technic of handling these materials.

In lieu of more specific information, design conditions may be considered as 78F and 50% R.H.

Department Stores

Research and practical experience has long established that the conditions most satisfactory to both customer and employee is 78 to 80F and a relative humidity of 50%. Temperatures above 80F have not

been satisfactory, while higher humidities tend to make odors noticeable and to make necessary a greater amount of outdoor air for odor dilution. Too low a temperature is not desirable for it is no longer necessary to impress customers with the fact that the store is air conditioned.

Comfort should not be stressed to the customer; rather, the customer should be unaware that the air conditioning system exists. The paramount thing is to have a system that functions—one that is definitely not uncomfortable in its results.

In department stores, it is impossible to have the temperature indoors change to the same degree as the outdoor temperature. The heat storage of the building simply does not follow the predictions made. It is far more desirable to hold a temperature at a point that will prevent customers from perspiring. So-called temperature shock is merely an awareness, as one enters, that the place is cooled.

Hospitals

Air conditioned space in hospitals is generally limited to the operating room, recovery room, and labor and delivery rooms of the maternity wing. Air conditioning has been used in rooms for the care of premature infants, treatment of fevers, and a variety of ailments that are common during periods of intense summer heat.

The operating room is the one that is most generally air conditioned. For this and also for the labor room, temperature is from 78 to 80F and relative humidity from 55 to 60%. The high relative humidity is necessary to eliminate possible explosions due to anesthetic gases. Because of this high relative humidity, steps must be taken to prevent condensation and frosting on windows during cold weather.

Nothing more than ordinary filtering is practiced because ordinances in some cities prohibit air recirculation. However, activated carbon has been helpful in removing odors and traces of anesthesia gases.

Libraries

Record material in libraries such as paper, leather, cloth, thread and adhesives are susceptible to decay brought about by unfavorable conditions of temperature and humidity. Extreme dryness makes these materials so brittle that books and manuscripts show signs of repeated handling. Paper, cotton and leather, under certain conditions, are subject to mildew which propagates by spores nearly always present in air. These grow slowly below 40F and very rapidly at the optimum temperature which varies with the species of growth. Since an abundance of water is required for their growth, if the relative humidity is kept below 80%, paper, cotton and leather will not contain enough moisture for such growth but glue and starch will still be susceptible. Therefore, if these materials are protected in the bookbinding process by adding a bactericide such as betanaphthol, mildew will not form.

It is fortunate that air conditions for personal comfort are similar to air conditions favorable for the storage of records and books in libraries. Suitable values are: summer temperature, 80F; winter temperature, 70F; relative humidity, 40-50%. However, in extremely cold weather, a lower relative humidity is necessary to prevent moisture condensation on windows. Under the conditions stated, the strength and flexibility of record materials are not adversely affected, and growth of molds and fungi is inhibited.

Motion Picture Theaters

The accepted standard for air conditioning motion picture theaters is to maintain summer conditions of 78-80F and 50% R.H., based on an outside temperature of 95F. However, in the South it is held at 80F while in Cuba, for example, it is 85F.

More than anything else, excessive relative humidity will lessen the sensation of comfort of occupants seated in the theater. While it is expected that the next advance in theater air conditioning will be the development of an independent means for dehumidification, at present reduction in humidity is obtained by lowering the temperature of the air supply to a point required for theater cooling, and then to raise the temperature of air leaving the cooling coil by using the heat in the return air from the theater, or by depending on steam reheating coils.

Tests have shown that the desired differential between inside and outside temperatures should be from 12 to 15F. Some theaters have inside-outside controls.

Clean air is considered desirable to protect theater furnishings and decorations and also from the health standpoint. While electrostatic filters are considered best, they are also the costliest type of air filter. Types generally used are the throwaway type or those that can be washed and reused again. Most operators consider filters an operating nuisance. Where the air conditioning system employs washers, the washers are relied upon to remove dirt from the supply air.

Passenger Railroad Cars

Temperatures generally maintained in passenger railroad cars during day periods is 76F and at night, 72F; the approximate relative humidity both times is 48%. These conditions are maintained during normal summer operation with outside temperatures of 95F D.B. and 75F W.B.

The air conditioning unit is located beneath the roof at one end of the car. Here fresh air is drawn into the blowers through air filters where it is cleaned of all foreign matter. The air then passes through coils, and after the air is cooled it is distributed in the car space.

Photographic Studios

Both personal comfort and industrial air conditioning must be considered in the design of commercial photographic studios. The studio proper, dressing rooms, and offices are maintained at 74F and 30 to 40% R.H., as listed in Table 2.

In the printing and developing rooms, not only must air conditions be controlled, but it is desirable to maintain developing solutions and rinse water at proper temperatures for the time of development

TABLE 2—DESIGN CONDITIONS FOR COMMERCIAL PHOTOGRAPHIC STUDIOS

Room or Process	Temperature, F	Relative Humidity, %
Studio, dressing rooms and offices	74	30-40
Developing of film	70-75	60
Film drying	75-80	50
Printing	70	70
Cutting	72	65
Film and paper storage	60	45

and the quality of the final product is directly related to a controlled solution and wash-water temperature. Heat is liberated during the printing, enlarging and drying processes and this must be removed. Controlled conditions are also necessary for the storage of photosensitive materials such as film and paper.

Restaurants

Three areas must be considered in air conditioning restaurants—the dining room proper, the space reserved for the bar, and the kitchen.

In the dining areas, conditions are held at 76F and 50% R.H. Cafeterias, which have the problem of the open steam tables, maintain temperatures one or two degrees lower than those followed in conventional dining areas. On warm days, an attempt is made to maintain a differential of 12 to 14F between inside and outside conditions. It is important that a positive pressure be created as compared with the kitchen in order to prevent kitchen air and odors from entering the dining areas.

Because of the higher metabolic rate of persons drinking at the bar, as compared with those dining in the restaurant, it is necessary to supply a greater amount of cool air to create the necessary coolness.

One large restaurant chain keeps its kitchens at 76 to 80F with a relative humidity of 55%. The summer condition is 80F. It is rather expensive to air condition kitchens because of the large heat gain produced in cooking; therefore, air-cooled kitchens are not too common. From the cost standpoint, it is advantageous when establishing design conditions to figure on temperatures in the kitchen being 5F higher than those in the dining areas. However, the dew point in both places is the same. This slightly raises the wet bulb temperature in the kitchen over that in the restaurant.

Retail Food Stores

Government statistics show that there are more than 500,000 establishments in the United States that handle food. While very few of this number are air conditioned or even ventilated, it has been proven that besides comfortable conditions for employees and customers, air conditioning has improved the keeping qualities of the food being sold.

Cooling can be accomplished by ventilation with large quantities of outside air, evaporative cooling, and by mechanical cooling. Climatic conditions in the area where the store is located will determine which of these three methods will prove the most satisfactory. For design conditions, three climatic zones can be established, each suitable for one of these methods of cooling.

Ventilation Zone—This covers areas of outside design dry bulb temperatures of 85F and lower.

Evaporative Cooling Zone—This should have low outside design wet bulb temperatures from 62 to 70F and outside design dry bulb temperatures from 95 to 110F. It is preferable to have a differential between wet and dry bulb of 25F or more.

Mechanical Cooling Zone—This includes areas of high outside wet bulb temperatures of 70 to 80F and outside design dry bulb temperatures of 90 to 110F.

There is a gap in these zones between 86 and 89F design dry bulb temperatures where ventilation is ordinarily not satisfactory and it is difficult to justify mechanical cooling.

Where stores are mechanically air conditioned, inside conditions are held at 80F dry bulb and about 50% R.H. The differential between inside and outside temperatures is from 15 to 20F.

Television Studios

It is considered good practice in the air conditioning of television studios to have a maximum inside-outside temperature differential of 20F. The chief problem is to provide conditions that would not endanger the health of the performers because of wide variations in ambient temperatures.

In general, winter air conditions should be 72F and 45 to 50% R.H., with maximum summer conditions of 80F and 50 to 60% R.H., depending on outside temperature and wet bulb reading.

Women's Specialty Store

In a women's specialty store, air conditioning results in personal comfort for customer and employee, and in large monetary savings for the management by preventing perspiration damage to the dresses and wearing apparel. It is most important that conditions be established for "drying out" the customer before she tries on a dress, and experience has shown that the time spent in selecting a dress in an air-cooled atmosphere provides a sufficient cooling-off period, before the dress is tried on.

The selling area is maintained at 76F and 50% R.H. during the summer; for the winter months, temperature is 74F with little attention paid to humidity.

Since customers spend more time in the fitting room than in any other part of the store, a large part of the sales is made in the fitting area. Because the fitting section is small in cubical volume, and has a greater occupancy concentration than any other part of the store, it presents a serious air conditioning problem. This area, as compared with the main part of the store, requires a slightly higher temperature during the summer period, and also during the heating season. There should be a 2 to 3F temperature differential between fitting and general sales areas. Sufficient outside air must be circulated to prevent odors. Exhaust air from the fitting room should be discarded, and never recirculated.

Throttling Effects of Gate versus Globe Valves

T. W. REYNOLDS
Chief, Air Conditioning Division, Abbott, Merkt & Co.,
New York

AMONG my correspondence is a letter discussing the relative merits of gate valves and globe valves to obtain throttling; and to prove that the gate valve is the better of the two for throttling, my correspondent sends the following data:

Per Cent of Stem Rise	Per Cent of Maximum Flow	
	Gate Valve	Globe Valve
5	2	64
10	3	78
15	5	85
18	10	88
20	20	90
25	58	93

In the first place, the data seem to prove just the reverse of what the correspondent is trying to claim. Secondly, the phraseology is confusing, for certainly, it is hard for me to conceive of a valve doing throttling by opening it up. One always thinks of throttling as being achieved in a downward direction and uses the words "throttle down," not "throttle up." Our correspondent does not inform us as to the complete background of the data, or the authority who compiled it, which, incidentally, I have never seen before, nor can I find anyone else who has.

At any rate, better to visualize the data, they have been plotted in the accompanying curves against "Per cent of Stem Closure" which are of course the values in the first column of the table subtracted from 100.

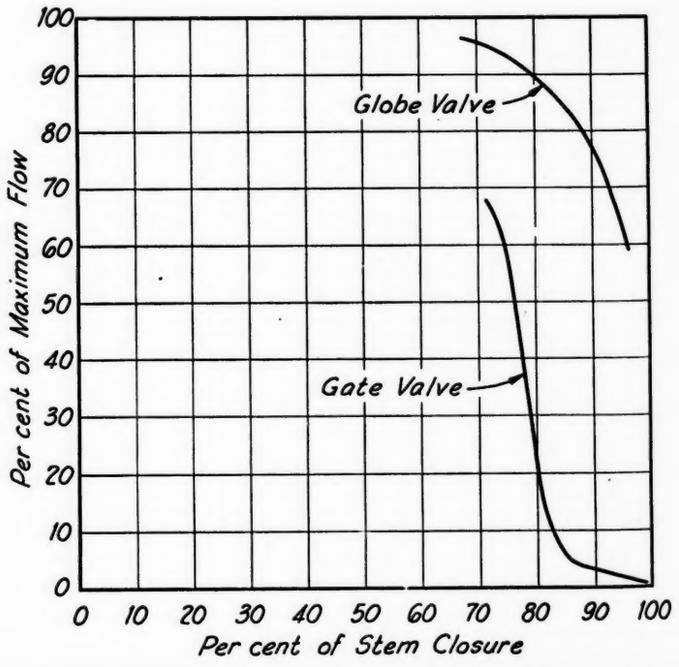
Now all my working life I have been reading authoritative textbooks and valve manufacturers' literature, the gist of which is "never use a gate valve as a throttling valve, always use a globe valve," and during these years have been watching men in powerhouses operate throttling valves which were all of the globe type.

Admittedly, a most important reason for using a globe valve as a throttling valve is one of convenient and cheap repair of its renewable disc, since throttling is an action that produces considerable wear and tear. Assuming, however, for dear old discussion's sake, both gate and globe to be on an equal basis as to wear and tear, could we all be wrong about the globe valve? Could the gate valve under certain conditions be the better valve for throttling control? The writer has asked this question of practically all the valve experts he can think of, and they all conclude with the answer that a globe valve is designed to take the abuse of throttling action. Nevertheless, the writer feels that we do not know all we should know about the different throttling effects of the two types of valves. In any event, a discussion seems to be of interest.

Throttling Valves are Usually Globular

Some have pointed out that throttling valves of the automatic type, such as pressure reducing valves, are usually of globular construction, but this should not necessarily prove that their throttling action is better than an automatic throttling valve of the gate type, if such a type could be evolved for this purpose. Here, again, wear, tear, and convenient repair, might be the only reason for the automatic throttling globe valve.

We follow along with globular construction with nearly all throttling devices; for example, with the plug type of globe valve. This valve has a tapering plug entering a conical seat and therefore gives wider contact surfaces for less wear, as well as much greater refinement in control. If such control be not sufficient, there is the needle valve with the long taper which secures tight closure and, coupled with the fine-pitched stem thread, makes possible the last word in close adjustment of flow through the valve. The port opening through the seat of the valve is not full pipe size because closer regulation is secured with reduced port openings. For this reason, needle valves are often made with two or three different sizes of seat openings to suit job conditions.



Throttling characteristics of gate versus globe valves.

Referring back to the tabular data, one cannot see how these data are truly comparative. For example, a globe valve when fully open starts out with a considerable handicap. It already has the same resistance as a gate valve 60% closed, or 40% open, as the correspondent would look at it, hence the same percentage of maximum flow for each valve would not be the same quantity in some other terms (gallons, for example). With both valves of the same size and wide open, the gate valve, due to very little resistance, would pass much more.

This great resistance of the globe valve comes about because of two right-angled turns through the valve, although there apparently are similar turns for a nearly closed gate valve; at least most of the gate valve's flow must dip down under the gate and come up again. For this nearly closed position, the curve for the gate valve shows the kind of control achieved —that is, much turning of the handwheel for slight changes of flow. For example, for 5% to 20% stem rise the gate valve changes its per cent of maximum flow from 2% to 10%, a difference of only 8%, whereas the globe valve with the same per cent of stem rise changes its per cent of maximum flow from 65% to 87%, a difference of 22%. It will also be noticed that the real control of a gate valve is confined to a narrow limit below 25% stem rise. There is very little control above that point.

The curves also show that the gate valve, where it does control, does so in small increments and at points where the globe valve has less refinement of control, but these points are at nearly closed positions, at positions not desired. The globe valve curve shows desirable characteristics at points where we want them, at partial and minor positions of opening. For example, from 75% down to 95% of stem closure, the flow in a globe valve is reduced from about 95% to 65% and, as a rule, who wants to reduce below 65%?

Apparently a gate valve has to be nearly closed before it provides enough turbulence to get anywhere, somewhat the same as with the ordinary damper in an air duct, which has to be nearly closed before any control is noticed, and then the slightest movement either side of the control point gives too little or too much air by far. Supposedly, a throttle valve is a valve to reduce the capacity to something like 90% or 75% or at the most not over 50%, for if one wants to reduce well down toward 0%, he might better use two ordinary stop valves, nearly close one and then throttle with the other one.

Disadvantages of Each

Yes, the globe valve must be the right valve for throttling purposes, else why use it when it has certain disadvantages in respects other than throttling. Incidentally, when the angle type valve is used there is much less resistance, and there is a complete drainage and an absence of sediment. The globe valve has an interior web or diaphragm which with the valve in the upright position has a tendency to collect sediment back of it. This web also prevents full drainage unless the valve stem is turned downward for complete drainage, in which case sediment may collect in the bonnet to damage stem threads and condensation may drip down around the valve stem.

As for the gate valve, it too has disadvantages, since if closed tight while cold, when steam is turned on, the spindle is under a stress as it tries to lengthen with expansion. If a gate valve is used for throttling, which it apparently should not be, the lower edge of the disc will be subject to wire drawing and the disc will be prone to destructive chattering. A gate valve is not so easily repaired; therefore, if the service is severe, it is desirable that a union be placed in the line adjacent to it.

Advantages of Each

The gate valve, so-called for its gate-like disc that moves across the path of flow, also has its advantages. It does give straightway flow with very little resistance and complete drainage, and otherwise gives good service when used with the disc in full opened or closed position, the purpose for which it is intended. The globe valve likewise has certain advantages, such as tight closure over long periods of time, ability to throttle, and convenient and quick regrinding features for repair of the wear occasioned by the wire drawing of throttling. On the one hand, a globe valve tends to wear due to frequent operation for throttling, and, on the other hand, the wear on threads of the stem is less because the handwheel requires less turns to open. The last mentioned feature also saves the operator's time.

There are more threads per inch on the stem of a globe valve, particularly in the smaller sizes; for example, five on a 2-inch globe valve and four on a 2-inch gate valve. To completely open a 1-inch gate valve requires from 1 to $1\frac{1}{8}$-inch stem rise, but for a 1-inch globe valve only $\frac{1}{4}$ to $\frac{3}{8}$ inch rise is required. In fact, the basic design for lift in a globe valve is 25% of the pipe diameter. For example, the area of passage in a 1-inch gate valve would be roughly $0.7854 \times 1^2 = 0.7854$ sq in., and in a 1-inch globe valve, would be the same, since $3.1416 \times 1 \times 25\% = 0.7854$ sq in. It should also be noted that from the closed position a gate valve may give no control at all for the first turn to open, because the wedge is down in the bottom depression of the valve body and pressure must be taken off the wedge.

In comparing the two valves one should also consider areas and equal lift. As the gate valve is opened it exposes much area to wear, but a globe disc descends vertically over a horizontal periphery to give desirable throttling characteristics. It can be cracked just off its seat, yet control. It need not be lifted 100% of the pipe diameter to fully open, but only 25%, as this slight lift gives a clearance around its periphery which will equal the area of the pipe diameter.

In closing, one should mention that this discussion over the relative merits of the two types of valves all came about because of gate valves generally used in water connections around coils of a particular installation where the drawings called for globe valves. Obviously, with gate valves already in place, the question naturally arose as to why the job could not continue with what was already in use.

Controlled Conditions Featured in Refinery Shop Building

THE first section of a large "controlled conditions" repair and maintenance facilities building, bearing a strong general resemblance to the huge bomber plants built at Tulsa and Fort Worth during the war years, has been designed and constructed by H. K. Ferguson Co. at the Baytown, Texas, Humble Oil and Refining Co. refinery.

The building—720 ft long, 308 ft wide and with an over-all height of 44 ft 8 inches—will bring under one roof all the refinery's repair and maintenance shops, instead of having them scattered throughout the refinery area. It will be a completely windowless structure, lighted by incandescent and fluorescent lights, and with interior walls and ceiling designed for maximum sound deadening and light reflection.

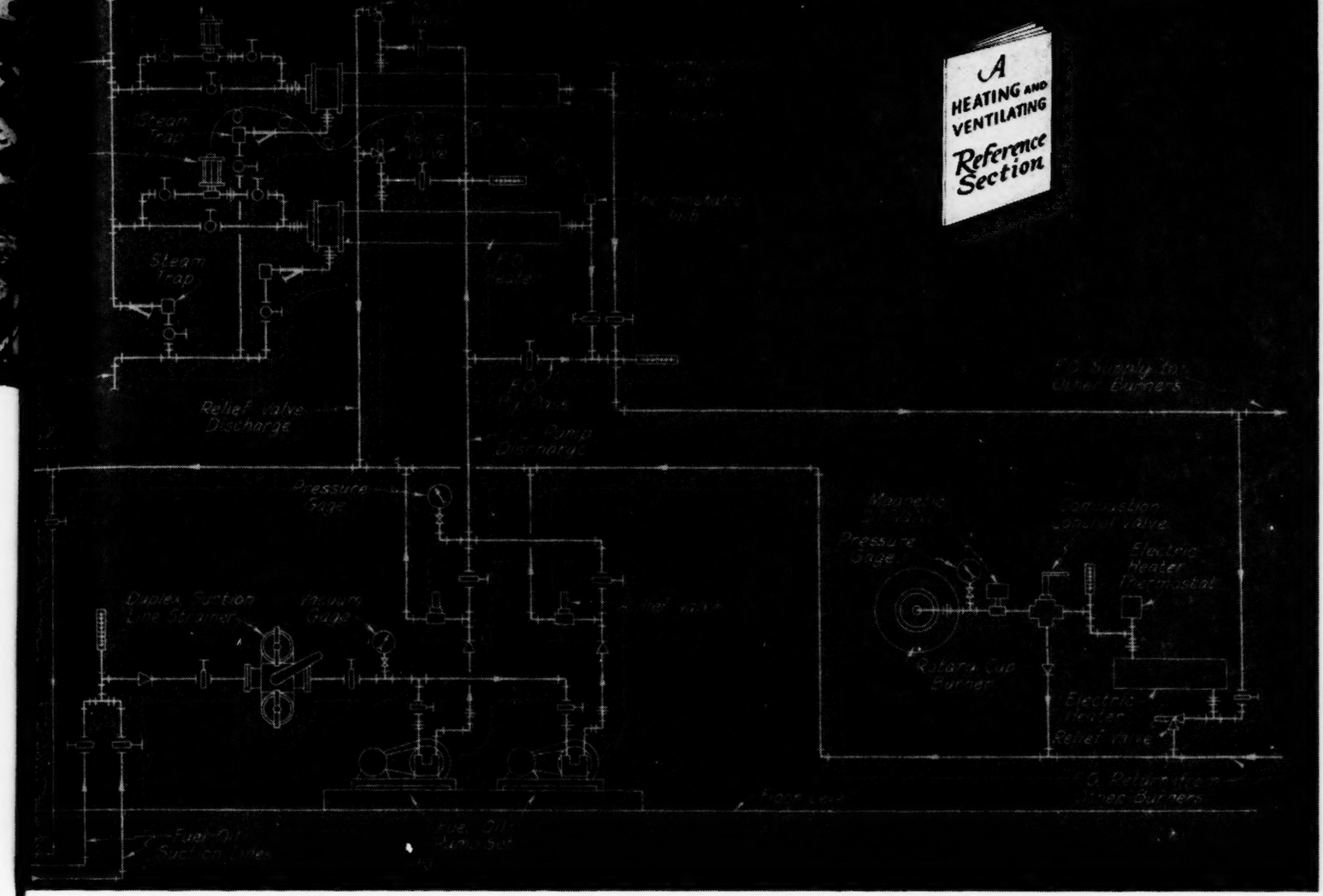
Specifications require that during the summer months the inside temperature shall not exceed 78F, when the outside temperature is 95F D.B. and 80F W.B. Relative humidity is not to exceed 50% with an outside wet bulb temperature of 80F. In winter, the temperature is to be maintained at a minimum of 72F when the outside dry bulb temperature is 20F, and a relative humidity of at least 30% is to be maintained when the inside temperature does not exceed 72F, and the outside dry bulb temperature is 32F. Heat loads in various parts of the building will vary and the building will be zoned.

Laying precast roof slabs over insulation blanket.

The completed section of the building is 312 ft long by 308 ft wide. The second section, 168 ft long and the same width, is now under construction and will be completed early in 1950. Construction of the third section will follow completion of the second section. Fiberglas insulation in walls and ceilings of all three sections will be heavily relied upon to help maintain specified summer and winter temperatures. The air conditioning equipment to serve all three sections will be installed in the second section. One 550-ton and one 1100-ton York centrifugal compressor are now being installed in this section, and room is provided for the installation of two additional 1100-ton units. Freon-22 will be employed as the refrigerant.

The side walls of the completed first section are built up, from the inside out, as follows: expanded metal lath, white Fiberglas mat, two-inch-thick Fiberglas metal-mesh insulation blanket, two-inch-thick Fiberglas insulation board, corrugated asbestos siding. Ceiling construction, from the inside out, is expanded metal lath, one-inch-thick sewn Fiberglas insulation blanket faced on the inner side with white cloth woven of Fiberglas yarns, sisa kraft vapor barrier, three-inch-thick Fiberglas insulation blanket. Above the ceiling is an air space, then precast roof slab topped by a built-up roof.

The white Fiberglas mat in the walls and the white glass cloth in the ceiling are employed for light reflection and to provide a porous surface that will permit sound waves to pass through and be absorbed by the Fiberglas insulation.



PIPING FOR FUEL OIL TANKS AND FUEL OIL BURNERS

EVERETT F. OPPERMAN
Petroleum Heat & Power Co., Stamford, Conn.

Piping for Fuel Oil Tanks and Fuel Oil Burners

EVERETT F. OPPERMAN
Petroleum Heat & Power Co., Stamford, Conn.

A practical presentation of information on piping for domestic and industrial fuel-oil-burning installations. Piping layouts are presented for both the pressure atomizing type and the horizontal rotary cup burner. While the illustrations are developed around these two burners mentioned, the piping principles may be applied to other types as well.

PIPING systems as applied to water, steam, or gas, do not present a difficult problem to the average pipe-fitter. However, with piping systems for fuel oil, and especially the residual oils, one requires a knowledge or experience far beyond the ability to properly cut, thread, and screw pipe together.

Probably the most common error that is made by the inexperienced mechanic is the inadequate pipe sizes selected for heavy oil installations. Therefore, it is essential that pipe sizing be the decision of someone well versed or experienced in the flow of viscous fluids.

The calculation of oil flow through pipes is much more complicated than in the case of water, which is a well-defined fluid of almost constant physical characteristics within ordinary temperature limits. While the flow of water through pipes offers in itself a sufficiently difficult problem, still the laws governing it have been determined empirically with an exactness sufficient to meet all practical requirements. Oil is the opposite. No two oils are exactly alike, and any one oil is subject to important physical changes which take place under variable temperature.

The principal difference between oil and water from a pipe flow point of view lies in variable viscosity. Ordinary crude oil is not a simple homogeneous liquid such as water, but it is a very complex substance composed of compounds of carbon and hydrogen which exist in petroleum in almost bewildering number. For this reason it is impossible to obtain any simple empirical equation which is universally applicable to oil flow in pipes. Table 1 gives the recommended minimum fuel oil suction and return pipe sizes and Table 2 the recommended minimum pump discharge pipe sizes between pump and burner or preheater. Where unusual conditions are encountered, these sizes are to be increased accordingly.

Most every pipe-fitter knows the essentials of a good piping job. However, as a reminder, good workmanship will include: That a pipe line between two points be as short and direct as possible, with as few turns and fittings as the conditions of installation permit; that pipe threads be clean cut with new dies; that pipe ends be thoroughly and smoothly reamed out after cutting; that all piping be firmly supported; that valves be located where they are accessible; that joints be made up tightly but not distorted; that piping be thoroughly clear of debris or dirt before assembling; that fittings are sound and free of cracks and sand holes; that a suitable, good grade oil-proof joint compound is applied to the male thread only.

The National Board of Fire Underwriters has set up specific regulations regarding the installation of fuel oil piping. Where local regulations exist they take precedence; however, where they are nonexistent, the National Board regulations are followed.

Piping Materials

Materials for fuel oil piping systems are, with few exceptions, the same as those used for general piping. All piping shall be standard full weight wrought iron, steel, or brass pipe with standard fittings, or approved brass or copper tubing with approved fit-

TABLE 1—RECOMMENDED MINIMUM SUCTION AND RETURN PIPE SIZES FOR FUEL OIL LINES

Equivalent Length of Suction Line, Feet*	Pump Capacity, Gallons per Hour															
	50			100			150		200		300		600		900	
	Grade of Oil (Number)															
	2	5	6	2	5	6	5	6	5	6	5	6	5	6	5	6
	Diameter of Pipe, Inches															
10-50	½	1¼	1½	¾	1½	1½	1½	2	1½	2	2	2	2½	3	3	4
60-100	½	1½	1½	¾	1½	2	2	2	2	2½	2	2½	3	3	3	4
110-150	¾	1½	2	1	2	2	2	2½	2½	2½	2½	3	3	4	4	4

*Notes:
1. Pipe sizes as shown are based on vertical suction lift not to exceed 10 ft. That is, bottom of storage tank must not be more than 10 ft below oil pump.
2. Equivalent length of pipe is to include all horizontal and vertical measured piping plus proper allowance for valves and fittings.
3. Suction line length in excess of 100 lineal feet is not recommended for systems using No. 5 or No. 6 oil. In such cases use separate pump set located in pump house or pump pit near storage tank.

TABLE 2—RECOMMENDED MINIMUM PUMP DISCHARGE PIPE SIZES BETWEEN PUMP AND BURNER OR PREHEATER

Equivalent Length of Pump Discharge Pipe, Feet*	Pump Capacity, Gallons per Hour													
	50		100		150		200		300		600		900	
	Grade of Oil (Number)													
	5	6	5	6	5	6	5	6	5	6	5	6	5	6
	Diameter of Pipe, Inches													
10-50	1	1¼	1¼	1¼	1¼	1½	1¼	1½	1½	2	2	2	2½	2½
60-100	1¼	1½	1¼	1½	1½	2	1½	2	2	2	2½	2½	2½	3
110-150	1¼	1½	1½	2	2	2	2	2	2	2½	2½	3	3	3
150-200	1¼	1½	1½	2	2	2	2	2½	2½	2½	3	3	3	4

*Equivalent length is equal to actual measured length plus allowance for fittings, as follows: Multiply the diameter of the pipe in feet by the following numbers to obtain the allowance to be added for each fitting: Elbows, 30; tees, 60; gate valves, 11; angle valves, 40; globe valves, 90.

tings, except that approved flexible metal hose may be used for reducing the effects of vibration and jarring or where rigid connections are impracticable.

Pipe used in the installation of domestic type burners shall not be smaller than ¼ inch iron pipe size, IPS; pipe used in the installation of industrial type burners shall not be smaller than ½ inch IPS. Copper or brass tubing shall not be smaller in size than the equivalent of the iron pipe sizes mentioned, with 0.035 inch nominal and 0.032 inch minimum wall thickness. Flexible metal hose shall be installed strictly in accordance with the limitations of its approval.

The use of copper tubing for suction and return lines has become very popular in oil burner work, especially for domestic installations, as in Fig. 1. Heavy copper tubing in 60 ft coils, used with heavy flared type copper fittings, provides a labor-saving and very durable installation. Where these lines are installed in underground trenches, care in back-filling the trench must be used, otherwise the tubing will become dented. Such obstructions will exert undue hardship and wear on the fuel oil pump. Therefore, all sharp rocks should be removed from the trench and a lining of soft dirt should be thrown in before laying the tubing. A foot or so of soft dirt should cover the tubing before any gravel or rocks are thrown in. Heavy boulders should never be thrown in the trench over the tubing at any depth.

For industrial installations, Fig. 2, requiring 1 inch piping or larger, steel or wrought iron are the principal materials used for fuel oil piping. Standard weight steel pipe and standard malleable fittings are the most popular. Galvanized piping should not be used for oil lines. The galvanizing is inclined to chip off and cause trouble in the pump and strainer. Where a rust-resisting material is necessary, wrought iron pipe is strongly recommended. However, vent lines should be galvanized. Vent lines are open to the atmosphere and are subject to condensation that causes very rapid corrosion of the pipe.

Storage Tank Vents

All fuel oil storage tanks must be equipped with a vent pipe open to the outside air. These vents enable the tank "to breathe" with the change of liquid volume within the tank when being filled or emptied. When oil is pumped from the storage tank, the action of atmospheric pressure upon the liquid surface through the vent line forces oil to the pump inlet.

The National Board of Fire Underwriters regulations state that vent pipes and openings shall be of ample size to prevent abnormal pressure in the tank during filling, but they shall not be smaller than 1¼-inch pipe size as shown in Table 3.

Where storage tanks are filled by the use of a pump through tight connections, special consideration should be given to the size of the vent pipe to insure that it is adequate to prevent the development of abnormal pressure in the tank during filling. This may be accomplished by providing a vent pipe not less in size than the discharge of the pump.

Vent pipes should be arranged to drain back to the storage tank. The vent pipe should be connected to the tapping at the high end of the tank and should not extend more than 1 inch into the tank. Vent pipes should terminate outside of the building at a point not less than 2 ft horizontally or vertically from any window or other opening in the building. The outside end of the vent line is to be equipped with an approved weather-proof vent cap located sufficiently above the grade level to prevent it being obstructed with snow or ice. Tanks that are equipped with means for heating the oil should have vents located so that oil vapors, discharging from the vent, will not be subject to ignition. Vent pipes should not be cross-connected with fill pipes or return lines from burners.

Storage Tank Fill Lines

Storage tanks for fuel oil should be filled only through fill pipes terminating outside of the building at a point at least 2 ft from any building opening at the same or lower level. Fill terminals should be closed tight, when not in use, by a metal cover designed to prevent tampering. In tanks containing heating coils, the tank end of the fill line should be sealed by a trap, or else by extending the fill line to a point below the lower end of the suction stub. Auxiliary tanks should be filled by pumping from the main storage tanks and

TABLE 3—VENT DIAMETERS

Capacity of Tank, Gallons	Diameter of Vent Iron Pipe Size, Inches
0 to 500	1¼
501 to 3000	1½
3001 to 10000	2
10001 to 25000	2½
25001 to 50000	3

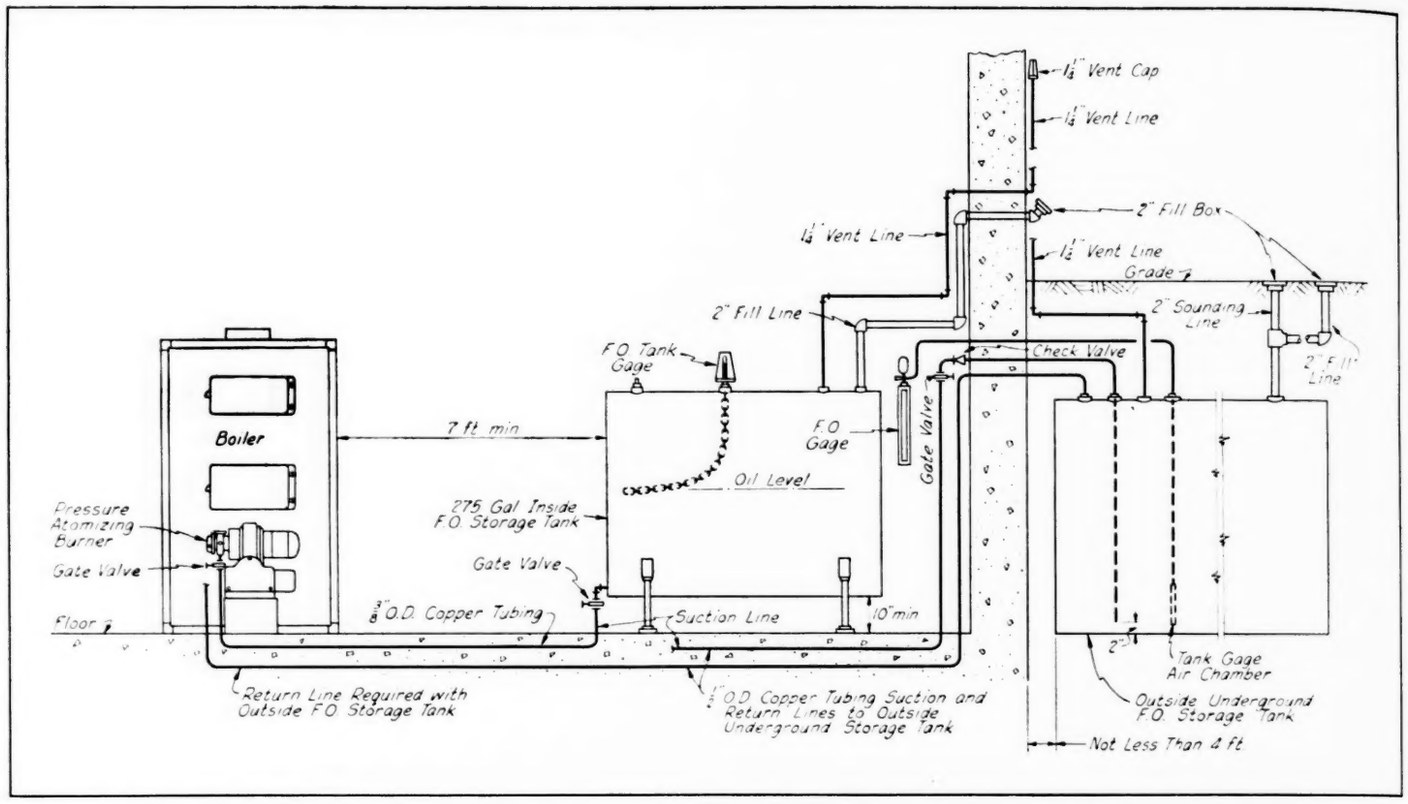


Fig. 1. Typical domestic oil burner installation showing piping to inside or to outside fuel oil tanks.

have overflows draining to the storage tank, at least one size larger than the supply pipe. Cross-connections, except between two storage tanks not exceeding 275 gallons individual capacity, permitting gravity flow from one tank to another are prohibited. Although overflow pipes of auxiliary gravity tanks are not to have valves or obstructions, overflow pipes of auxiliary pressure tanks are to be provided with interconnected valves or other means for automatically venting the tank during filling.

Valves

Readily accessible shut-off valves of approved type are to be placed in oil supply lines near each burner and close to gravity and pressure supply tanks. Shut-off valves of approved type are generally placed on each side of oil strainers not part of the oil burner unit, and on the discharge and suction side of oil pumps which pump directly to the burner but which are not part of the burner unit.

Where a shut-off valve is installed in the discharge line of an oil pump, an approved pressure relief valve shall be connected into the discharge line between the pump and the shut-off valve and arranged to return surplus oil to the storage tank or to by-pass it around the pump.

Where burners are not equipped with approved automatic devices for preventing abnormal discharge of oil at the burner, an approved automatically operated valve is recommended designed to shut off the oil supply in case of fire in the immediate vicinity of the burner. This may be accomplished by installing a quick-closing gate valve on the oil supply line at the point where the line enters the building. The valve is to be equipped with a lever and heavy weight arranged so that the action of the weight will always close the valve. The valve is held open by a fine wire attached to the weight or lever arm. A system of pulleys is strung overhead and fastened near the burner. A fusible link, inserted in the length of wire near the burner, is designed to fuse at about 150F, releasing the wire and thereby allowing the valve to shut off the oil supply.

National Board regulations at one time required an antisiphon valve at the high point of the suction line, when the fuel oil storage tank was above the burner.

Present regulations do not demand or mention the antisiphon valve. However, the regulations still recommend that approved automatically operated valves designed to shut off the oil supply in case of breakage of the oil supply piping, be installed where burners are not equipped with approved automatic devices for preventing abnormal discharge of oil at the burner. Unless local regulations require this item, it should be omitted. The purpose of the antisiphon valve is to prevent the storage tank from emptying its contents into the basement, by siphonic action, in the event the suction line be broken.

The antisiphon valve is spring loaded, having sufficient force to hold back the column of oil equal to the difference in elevation of the burner and the high point in the suction line. This valve, therefore, requires the operation of the pump to open the valve, and experience has shown that this valve does greater harm than good. The excessively high vacuum required to open the valve, along with sludge or rust requiring expensive service operation, has discouraged the use of this equipment. In addition, the possibility of a suction line breaking in such a manner that the oil siphons over from the tank onto the floor, is very remote. A good piping job is probably a better safeguard against such an accident.

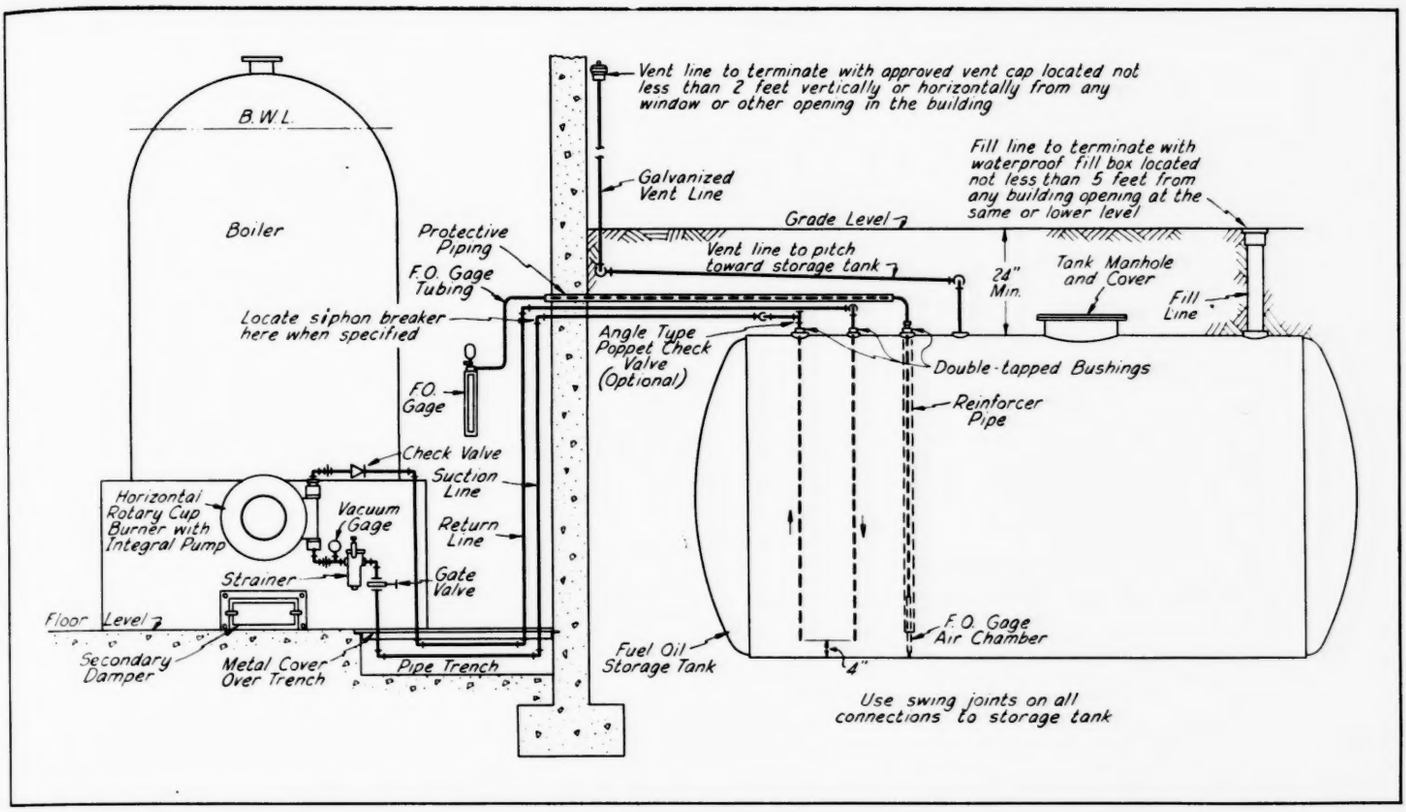

Vent line to terminate with approved vent cap located not less than 2 feet vertically or horizontally from any window or other opening in the building
B.W.L.
Boiler
Galvanized Vent Line
Fill line to terminate with waterproof fill box located not less than 5 feet from any building opening at the same or lower level
Grade Level
Protective Piping
F.O. Gage Tubing
Vent line to pitch toward storage tank
24" Min.
Tank Manhole and Cover
Fill Line
Locate siphon breaker here when specified
Angle Type Poppet Check Valve (Optional)
Double-tapped Bushings
F.O. Gage
Reinforcer Pipe
Check Valve
Suction Line
Horizontal Rotary Cup Burner with Integral Pump
Vacuum Gage
Return Line
Strainer
Gate Valve
Floor Level
F.O. Gage Air Chamber
Secondary Damper
Metal Cover Over Trench
Pipe Trench
Fuel Oil Storage Tank
4"
Use swing joints on all connections to storage tank

Fig. 2. Typical piping for a commercial installation burning No. 5 or lighter fuel oil, not requiring preheating of oil.

The foot valve is another item that has given considerable trouble, especially when used with residual fuel oils. This valve is generally located on the bottom of the suction stub within the storage tank and acts as a check valve to keep the suction line full of oil and the pump primed. However, the foot valve is subject to the sludge and dirt at the bottom of the tank and within a short time becomes a detriment rather than a help. In addition, the location of the foot valve requires the removal of piping for service and cleaning.

A check valve located within the basement serves a much better purpose than the foot valve. A good tight suction line equipped with a check valve, located near the burner, will have no need of a foot valve. An angle type poppet check valve located on top of the storage tank is sometimes used to advantage. If there is a long underground run of suction line, the check valve should be located at a point where the line enters the building, otherwise it may be located near the burner on the tank side of the strainer. When the storage tank is above the burner, a check valve serves no useful purpose and may be eliminated.

Fuel Oil Suction Line

Extreme care should be employed when installing the suction line. While suction lines should connect to stubs extending within a few inches of the tank bottom, sufficient clearance should be allowed so that an accumulation of water and sludge will not enter the line. The water and sludge may be removed by periodic pumping or by actual cleaning when access manholes are available in the storage tank. Many installations, especially industrial, use two suction lines. One suction stub is extended 4 to 6 inches from the tank bottom while the other terminates 12 to 18 inches above the tank bottom. The high suction line provides a means of pumping clean oil should the accumulation of water and sludge reach the low stub before cleaning of the tank can be arranged.

In installations where two or more burners are connected to the same storage tank, Fig. 3, a separate suction line should be run from the tank to each individual burner. While it is true that many installers have ignored advice and have used one suction line for two or more burners, this practice sooner or later will result in trouble and expense. At the start when both burner pumps are new, each one upon test will pull a vacuum close to 28 inches. However, no two pumps will wear identically and within a short time, a test will reveal that one pump will pull more vacuum than the other. The burner with the weak pump will become hard to start and unreliable. It is, therefore, imperative not to connect more than one pump to a suction line.

Suction stubs should be continuous one-piece pipes extending from the tank tapping to within 6 inches of the tank bottom. The connection between the tank, suction line, and the suction stub is made with a double tapped bushing. The double tapped bushing has an outside thread that enables it to be screwed into the tank bushing and in addition contains two inner tappings, one upper and one lower, to receive the suction line and suction stub, respectively. The tank bushing must be one pipe size larger than the suction stub to receive the double tapped bushing. Where the storage tank contains a vertical heating coil or suction bell, installed through a tank manhole, the entire unit, including the heating medium stubs to the heating coil, as well as both the suction and return oil stubs, are welded

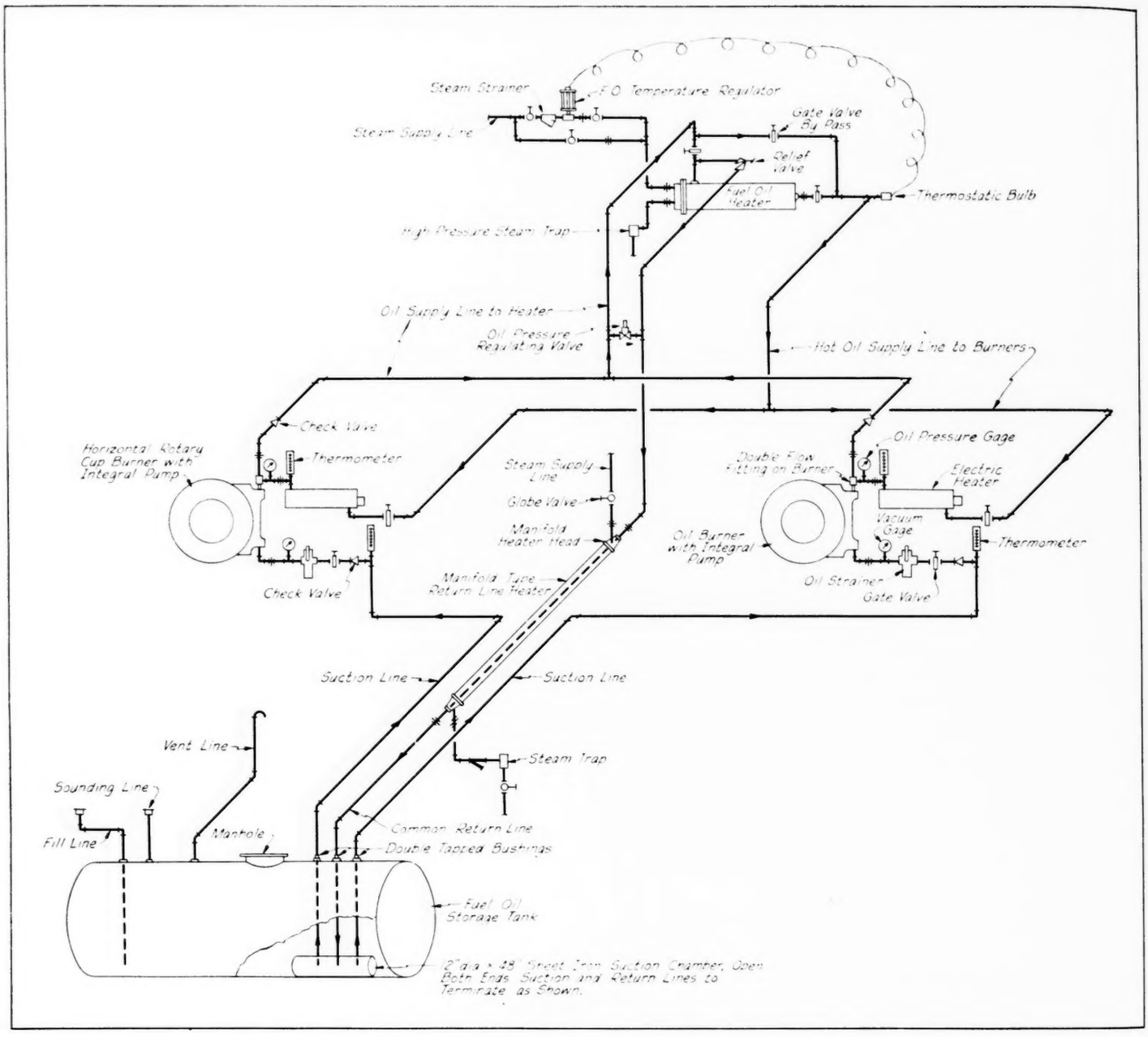


Fig. 3. Piping for a typical multiple burner installation.

into the manhole coverplate and the entire unit is installed or removed at one time.

Every suction line should contain at least one vacuum gage preferably located between the strainer and the pump.

Every suction line should contain two extra heavy ground joint unions. One union should be located near the burner hinge and the other should be located near the storage tank tapping. Where piping is welded into a tank manhole coverplate, unions should be placed so that the locknut of the union is directly over the periphery of the manhole. This will simplify the removal of the entire unit.

TABLE 4—SUCTION STRAINERS

Pipe Size of Strainer, Inches	Inside Area of Standard Steel Pipe, Sq In.	Ratio of Strainer Area to Pipe Area	Capacity, Lb Oil per Hr	
			Based on Flow Velocity, Ft per Min, of	
			30	35
1½	2.036	7.5 to 1	1,520	1,775
2	3.355	7.7 to 1	2,510	2,935
2½	4.788	9.2 to 1	3,585	4,190
3	7.393	5.9 to 1	5,530	6,460
4	12.730	7.6 to 1	9,550	11,130

Fuel Oil Strainers

All burners and fuel oil pumping equipment should have a strainer in the suction line to protect the pump from foreign matter that might be in the oil. Fuel oil strainers may be classified as perforated metal, wire mesh, metal disk, and filter cloth. Residual oils require perforated metal, or wire mesh strainer baskets, whereas filter cloth is used for the distillate oils.

The Underwriters' Laboratories require that strainers used with domestic burners shall have an effective screen area of the perforations of at least 10 sq in. for a pump capacity of 10 gph or less. For pump capacities in excess of 10 gph, the effective screen area shall be 10 sq in. plus ½ sq in. for each gallon per hour pump capacity in excess of 10 gph. The largest screen opening of the strainer shall have its smaller dimension not greater than 75% of the smaller dimensions of the smallest port protected by the screen. Domestic oil burner fuel units generally have the strainer located within the main housing surrounding the suction well.

TABLE 5—DISCHARGE STRAINERS

Pipe Size of Strainer, Inches	Inside Area of Extra Heavy Steel Pipe, Sq In.	Ratio of Strainer Area to Pipe Area	Capacity, Lb Oil per Hr	
			Based on Flow Velocity, Ft per Min, of	
			100	110
¾-1	0.719	9.5 to 1	1,792	1,971
1½	1.767	6.5 to 1	4,400	4,840
2	2.953	6.5 to 1	7,360	8,096
2½	4.238	8.7 to 1	10,590	11,649

Industrial oil burner installations employ completely self-contained strainers complete with housing, coverplate, yoke, gasket, drain plug, and the proper mesh strainer basket. The housing contains inlet and outlet pipe tappings and is inserted directly in the pipe line.

Strainers for industrial use may be of single or duplex construction. The duplex strainer consists of two strainer baskets within one housing, the strainers being separated by a plug cock to divert the oil through either strainer basket. The advantage of the duplex strainer is that either basket may be cleaned without interfering with the operation of the system. It is only necessary to turn the cock, deflecting the oil through the clean basket while the dirty one is cleaned.

In addition to the suction line strainer, it is customary to install a discharge strainer after the oil has passed through the preheating equipment, especially for the mechanical atomizing burner. Since the oil temperature has increased, the viscosity has decreased, and the oil will pass through a finer mesh strainer basket, thus removing small particles that would do harm at the fuel oil orifice. Discharge strainers are available in both single and duplex construction.

Industrial strainers are of sufficient size to house a strainer basket having a total area of perforations at least five times the area of the pipe size. This means that over four-fifths of the basket must be covered before the flow is restricted.

Tables 4 and 5 were taken from manufacturers' catalogs. While capacities will vary depending upon the particular source of strainer manufacture, these tables may be used as a guide for average conditions. Capacities are listed in pounds of oil per hour, based on

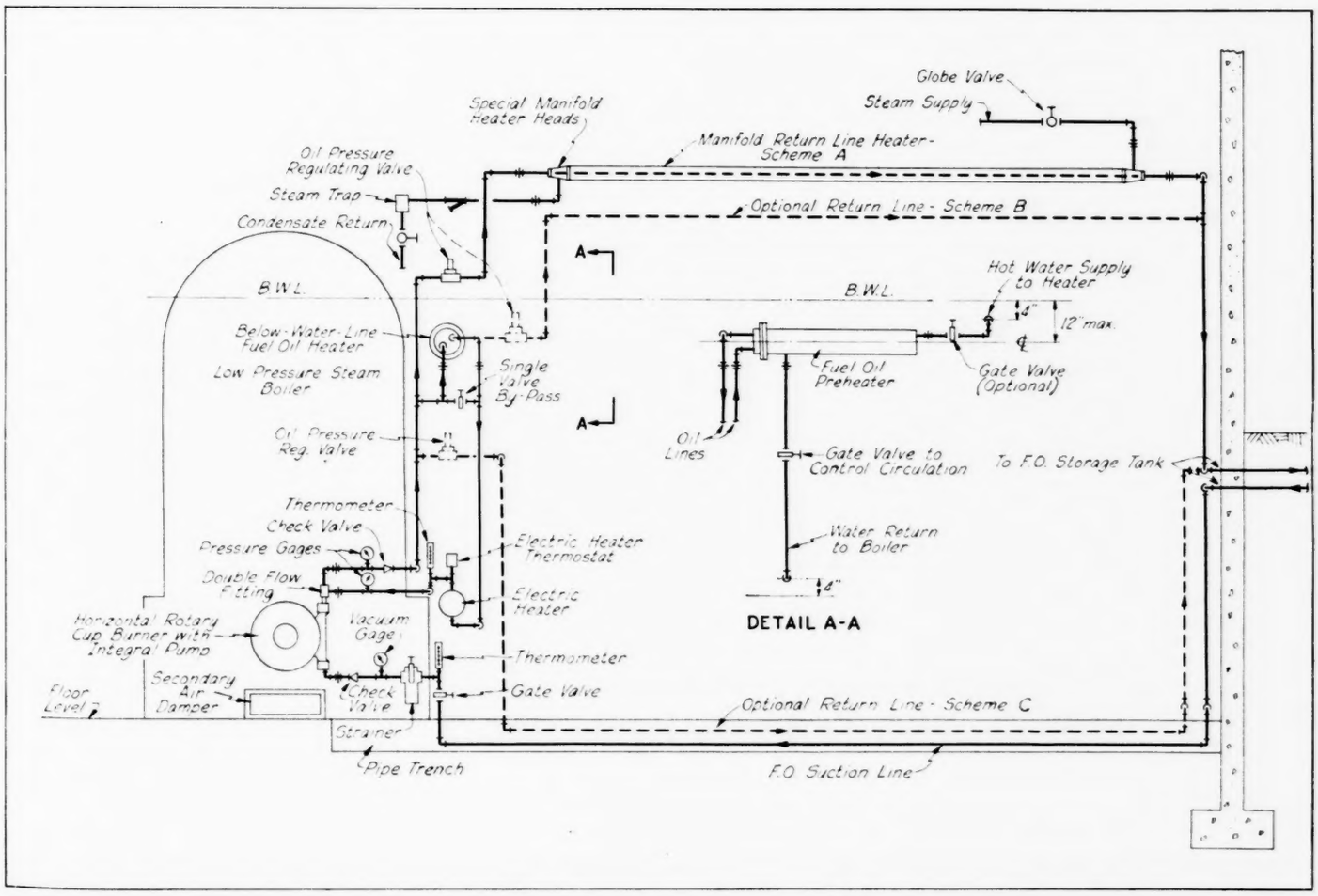


Fig. 4. Fuel oil piping arrangement for burning Bunker "C" fuel oil. This plan is for a low pressure steam heating boiler.

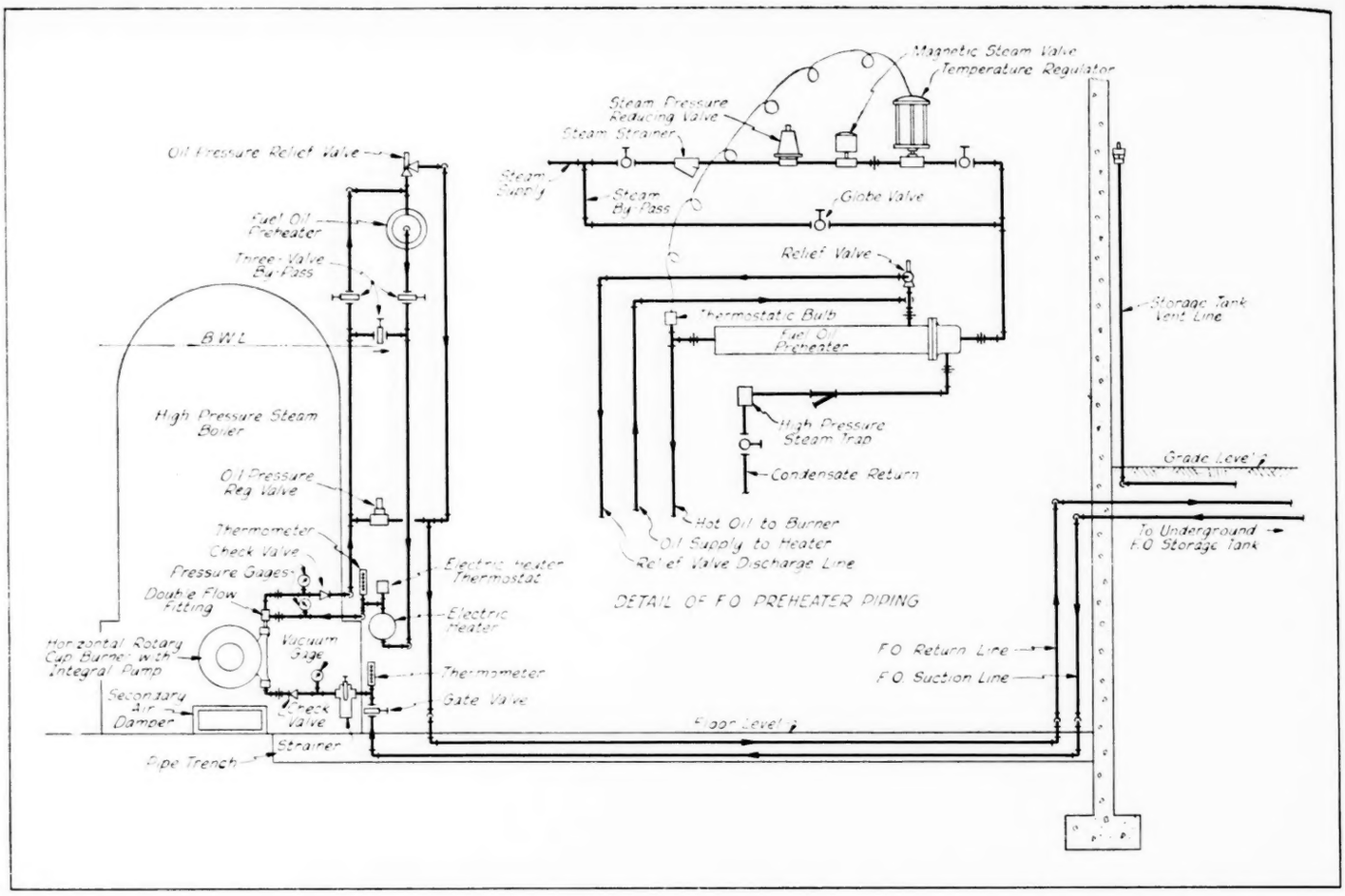


Fig. 5. Typical fuel oil piping installation for burning Bunker "C" fuel oil. This arrangement is for a high pressure steam heating boiler.

16 degrees A.P.I. oil weighing approximately 8 lb per gallon. For oils as light as 25 degrees A.P.I., subtract 7% from these figures.

Fuel Oil Return Line

Fuel oil pumps are selected to deliver at least 1½ times the burning rate. On so-called one-pipe installations, where only a suction line exists, the excess oil is diverted from the discharge line back to the suction side of the pump. On domestic burners employing the combination fuel unit, the by-passing of the oil from the discharge side back to the suction side is handled within the unit itself after slight alterations to the unit are made according to the manufacturer's instructions. Separate fuel oil pumps may have the pressure relief valve discharge the excess oil back into the suction line by external piping.

In general, the customary and preferred procedure is to run a return line back to the storage tank so that all excess oil flows back to the tank. On residual oil installations, the circulation of oil back to the storage tank is very important. This return oil, after passing through the preheater, carries a relatively high temperature back to the tank which, when mixed with oil within the tank, produces an oil temperature whereby the oil can be pumped efficiently. A return line is, therefore, required on all heavy oil installations and should be used on all domestic jobs where the tank is buried outside or where the tank is below the pump or burner. Use of the return line provides the advantage of venting the system without the aid of venting valves that are required with the one-pipe system.

While return line pipe sizes may be one size smaller than the suction line, the common practice is to run the return line the same size as the suction line. When the return line rises above the burner on its way to the storage tank, a check valve should be inserted in the return line near the burner hinge. Valves, shut-offs, or obstructions should not be inserted in the return line. Where more than one tank exists and it is necessary to install valves in the return line to divert the oil to either tank, a relief valve must be inserted in a by-pass line around the valves.

Unlike the suction line which must supply one burner only, one return line may serve two or more burners if sized accordingly. A check valve must be installed in each discharge branch from each burner or pump attached to the common return line.

At the storage tank, on residual oil installations, the return line is installed in a similar manner to that of the suction line with double tapped bushing and return stub extended to within 6 inches of the tank bottom and within 12 inches of the suction line. This will enable the heated oil in the return line to mix with the cold oil in the tank to obtain easy pumping. On distillate oil installations, the return stub is not necessary. However, many installers prefer the return stub which provides a potential suction line, should the original suction line become leaky or defective. Slight altera-

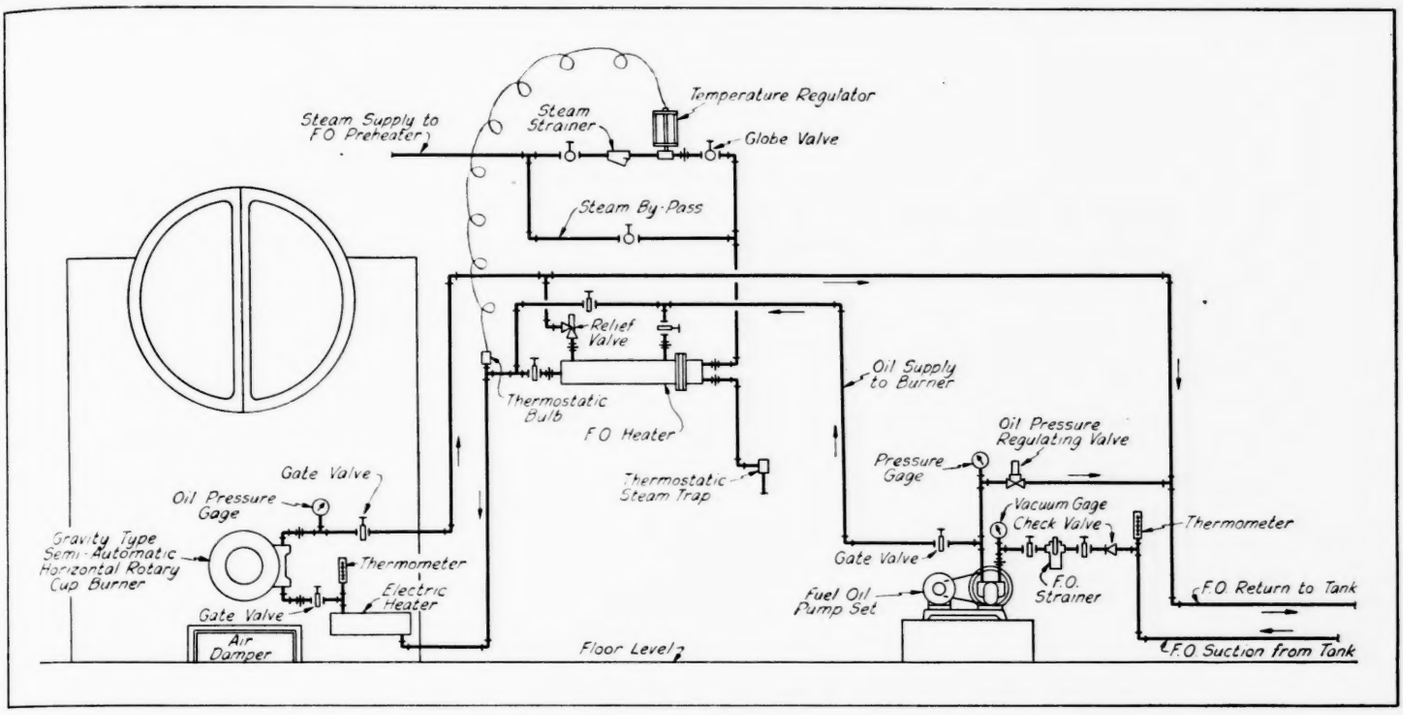


Fig. 6. Piping for installation of gravity type burner with a separate pump set.

tions at the burner can be made for a quick change-over. The return line should contain two extra heavy ground joint unions. One union should be located at the burner discharge hinge and the other should be located at the storage tank.

Preheating Fuel Oil

All No. 6 fuel oil, known as Bunker "C", and in many localities the more viscous grades of No. 5 oil, require preheating for efficient handling and combustion. In order to obtain the maximum heat release from these oils with the horizontal rotary cup burner, the minimum temperature to which the oil should be heated is 150F. All Bunker "C" oils, regardless of their differences at the lower temperatures, approach a viscosity within a very small range from one another when these oils are heated to temperatures above 150F. It is, therefore, obvious that the different characteristics of Bunker "C" oils will not present a difficult problem when these oils are heated to the proper temperature.

In view of the temperature at which Bunker "C" oil must be heated for proper and efficient burning, it is essential that preheating equipment should be located on the discharge side of the pump rather than the suction side, to prevent vapor lock. To prevent such a condition, the top temperature of oil in the suction line should not exceed 120F. From 80F to 110F will in most cases give satisfactory results. Oils being mixtures of various hydrocarbons, the lighter constituents begin to vaporize as soon as the oil is warmed. At 130-140F, this vaporization will evolve sufficient fumes to cause trouble on the suction side of the pump. With the diminished pressure resulting from the pump vacuum, the evolution of vapor is more rapid than for the same temperature at atmospheric pressure. Thus it is necessary that the suction line temperature does not exceed 120F.

Fuel oil heaters are vessels or containers which are maintained at high temperature through the agency called the heating medium. In general, the heating medium may be either steam, hot water, or electricity. Electricity is limited to heating the oil that is required to start a cold plant.

Preheaters, using either steam or hot water as the heating medium, are of shell and tube arrangement with the oil passing through the tubes and the heating medium passing through the shell and over the tubes or vice versa. The shells are constructed either of steel or cast iron. Tubes may be copper, steel or special alloys, depending upon the conditions of the service. Tubes may be straight or U-bend, depending upon construction. Most heaters are of multi-pass arrangement, in which the oil flows back and forth through the various passages of the heater which may be from two to six depending upon the construction.

The U-bend tube heaters are the least expensive because expansion and contraction does not present the difficult problem that is encountered with the straight tube construction. However, the difficulty in cleaning the U-bend tube heater is its greatest objection. Straight tube heaters are easily cleaned by rodding.

One type of straight tube heater has a scraping system built right in the heater itself with outside lever operating handle. This enables the heater to be kept at top efficiency at all times and with a minimum of effort. However, a contaminated-oil tank system should be arranged so that the dirt and sludge resulting from cleaning can be kept from entering the oil burning system.

Piping to fuel oil heaters should be arranged in such a way that the tubes may be removed without extensive pipe removal. This may be accomplished by placing unions on the periphery of the heater head flange.

In general, low pressure steam boilers make use of the below-the-water-line type of heater which is the

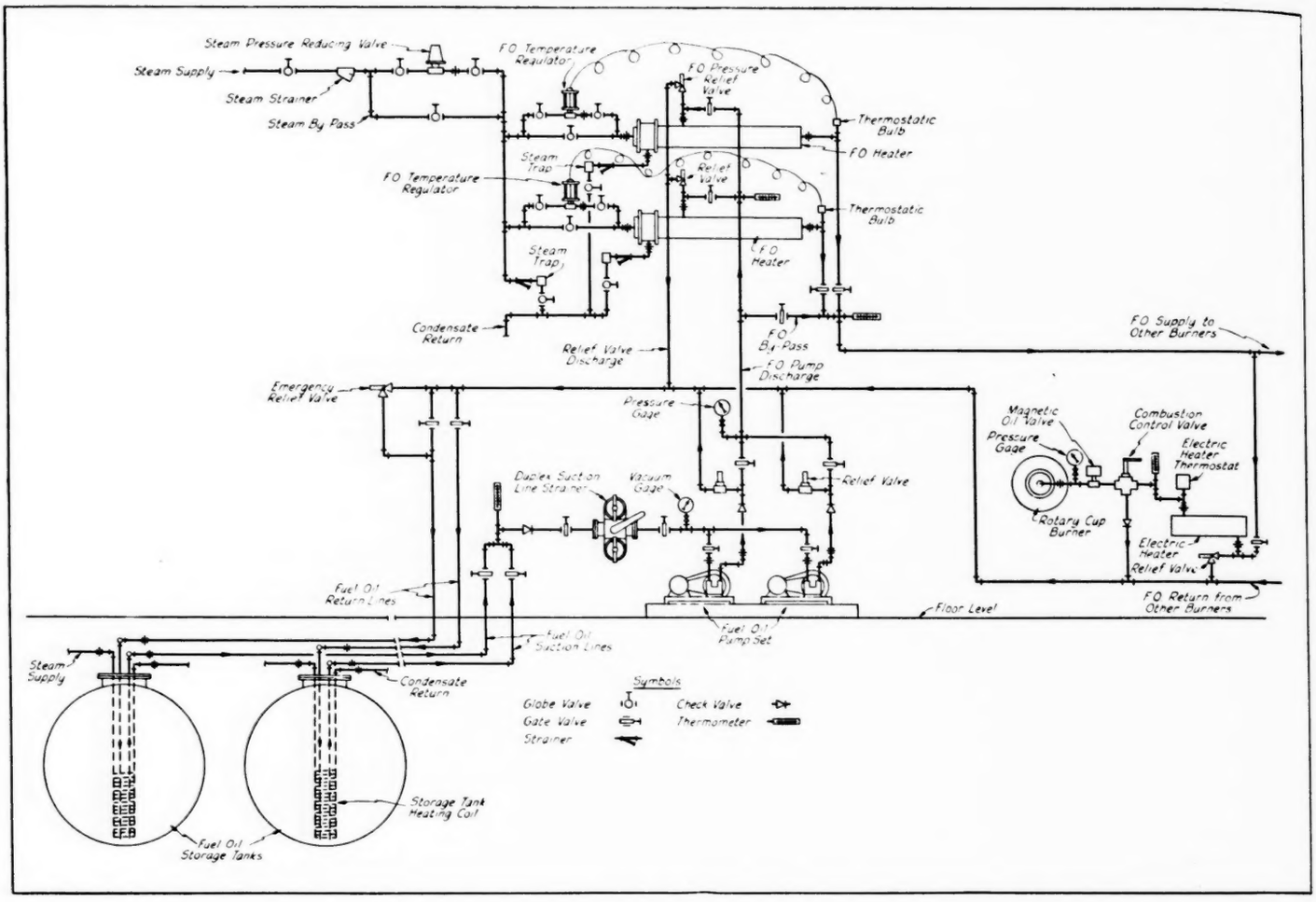


Fig. 7. Piping layout for a multiple burner installation showing duplicate pumps, heaters and storage tanks for Bunker "C" oil-burning system.

simplest and least expensive arrangement. Owing to the corrosive action of water found in many localities, heaters for this type of service should contain copper tubes. In order to obtain the maximum efficiency of this heater, Fig. 4, the heater should be set so that its center line is not greater than 12 inches below the boiler water line. Supply piping connections to the heater should be located about 4 inches below the boiler water line, and return water connection should be located low on the boiler water leg. Piping connections should be run full size of the heater tappings. A gate valve should be located in the return water connection to regulate the water circulation and thus regulate the oil temperature.

The advantage of this type arrangement is that the boiler water will hold its heat for many hours and provide a more or less warm start-up. Steam pressure, on the other hand, is quickly lost and does not provide heating until the plant is well under operation. The disadvantage of the below-water-line heater is that should a leak occur in the heater, oil will enter the boiler, presenting a serious and costly problem.

The preceding arrangement is used also for hot water heating boilers. However, in order to maintain a proper oil temperature for efficient burning, boiler water temperatures should be maintained at not less than 200F to obtain the proper transmission ratio of an indirect heater.

High pressure steam plants make use of steam operated oil heaters, Fig. 5. Steam heaters may be located at most any convenient place as long as arrangement for condensate return to the boiler is provided for, unless such condensate may be wasted to the sewer.

Owing to the high temperature of high pressure steam, the control of oil temperature is very important to prevent coking of the oil and rapid fouling of the heater. It is therefore essential that every steam-operated heater be equipped with a thermostatic regulator installed in the steam line to the heater, with the thermostatic bulb installed in the oil discharge line from the heater. This arrangement provides proper oil temperature control while the burner and pump are in operation. However, wher the burner shuts off by high pressure limit control or for other reasons, the boiler will remain full of steam for some time afterwards, and will continue heating the oil in the heater, which will not be in motion, and which will not pass over the thermostatic bulb to close the temperature regulator in the steam line to the heater.

It is therefore advisable to install, in addition to the temperature regulator, a magnetic steam valve in the steam line before the regulator. This valve should be wired so that it opens when the burner starts and closes when the burner stops. A steam line strainer should protect both regulator and magnetic valve. In addition, the condensate line from the heater must be equipped with a high pressure steam trap for efficient operation.

Fig. 6 shows a typical installation of a gravity type burner with separate pump set and steam operated preheater. Fig. 7 shows a typical piping layout for a large industrial installation, employing several burners.

Control of oil temperature on below-the-water-line type heater is not essential as it is doubtful that the temperature of this medium will become sufficient to cause coking. A hand-operated gate valve in the return water line from the heater to the boiler will be sufficient to control the water circulation which, in turn, will regulate the oil temperature.

Catalog ratings for most below-the-water-line heaters are based on a 90 to 150F oil temperature rise with boiler water temperature at 212F. The selection of a heater on this basis will result in a heater of insufficient capacity. Oil heaters should be selected on a basis of 80 to 180F temperature rise when using the available heating medium at existing temperature or pressure. Furthermore, heaters with small obstructed passages will create high back pressure against the pump. When selecting a heater, this characteristic must be considered as well as its heating capacity. When using high pressure steam, the greater transmission rate will allow the use of a much smaller heater. However, to obtain the desired oil flow, an undesirable back pressure may be created.

Many installations, where high pressure steam in excess of 50 lb working pressure is handy, make use of this available pressure and connect the oil heater direct without the use of a steam pressure reducing valve. This enables the selection of a smaller heater and thus reduces the initial cost. However, where steam pressures above 50 lb exist, the best procedure is to install a steam pressure reducing valve with the final steam pressure reduced to 25 lb and the heater selected on this final reduced pressure. This will increase the initial cost of the installation. However, over a period of time, the reduced cost of operation, better oil temperature control, less coking of the oil, greater service and longer life of the fuel oil heater, and greater dependability, will offset many times over any initial saving that could be made by the use of the high pressure steam.

Fuel oil heaters, when in operation, heat the oil and thus reduce the oil viscosity. This enables the oil to pass freely through the more or less restricted passages of the heater itself. On cold plant start-up, the viscous oil will pass through these passages only if very high pressure is exerted by the pump, or in other words a very high back pressure is created. Since cold start-up is handled by the electric preheater, it is essential to provide a valved by-pass full size around the hot water or steam operated heater to enable a free flow of oil to the electric heater. Many installations provide a three-valve by-pass which means that a valve will be installed in the supply and return connections to the heater as well as a valve in the by-pass line. When the three-valve by-pass arrangement is used, a small relief valve, usually ½ inch in size and set at 100 lb pressure, must protect the heater from expansion of the oil. All valves used on fuel oil pipe lines must be gate valves. Owing to their restricted passages, globe valves should never be used for oil burner work.

Thermometers

To enable the operator of an oil burner system to determine that the proper oil temperature is being obtained in the various pipes and at the burner, it is essential to provide a sufficient number of oil thermometers at desired locations. A minimum of three thermometers should be installed with each oil burner, one located on the suction line where the line enters the basement, one on the suction line at the burner hinge, and one after the preheaters but close to the burner. Additional thermometers may be installed at desired locations.

Fuel oil thermometers may be of the dial or of the straight type having a temperature scale of not less than 0-220F.

Pipe Covering and Insulation

Oil heaters and heavy equipment are of little value unless the proper temperature is maintained between the oil heater and its final destination. Therefore, thorough and efficient insulation of all piping, heaters, and equipment is a very essential part of every oil burner installation where heating of the oil is required.

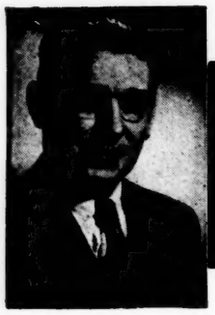
All oil piping within the building may be insulated with either 85% magnesia or asbestos air cell. Standard sectional pipe covering fabricated from these materials are easily applied to oil piping. Pipe fittings are covered with plastic asbestos or magnesia cement and troweled to a smooth hard finish. Pipe covering should be at least one inch thick and should have a heavy canvas outside jacket neatly pasted and banded. Underground piping is best insulated with hairfelt and tarred paper. The proper method is to wrap the fuel oil suction line, the fuel oil return line, and the steam or hot water supply and return lines to the tank heating coil altogether as one bundle so that the heat contained in the steam or hot water lines will heat the oil in the oil piping.

The hairfelt is first to be wrapped on the piping. It is then covered with heavy tarred paper which, in turn, is secured in place by strands of copper wire. Extreme care must be taken that the covering is entirely waterproof.

More elaborate installations of underground lines provide split vitrified tile in which the piping is laid. The interior of the tile may be packed with insulating wools after the pipes are in place, or a special tile may be purchased having molded insulation on the interior.

Correction

Since Everett F. Opperman completed his Reference Section on "Storage Tanks for Fuel-Oil-Burning Installations," in the December, 1949 issue, the National Board of Fire Underwriters has issued new regulations on fuel oil tanks. These do not call for the 3-way valve shown in Fig. 1 of that section. It is suggested, therefore, that the Reference Section be checked with the new rules.



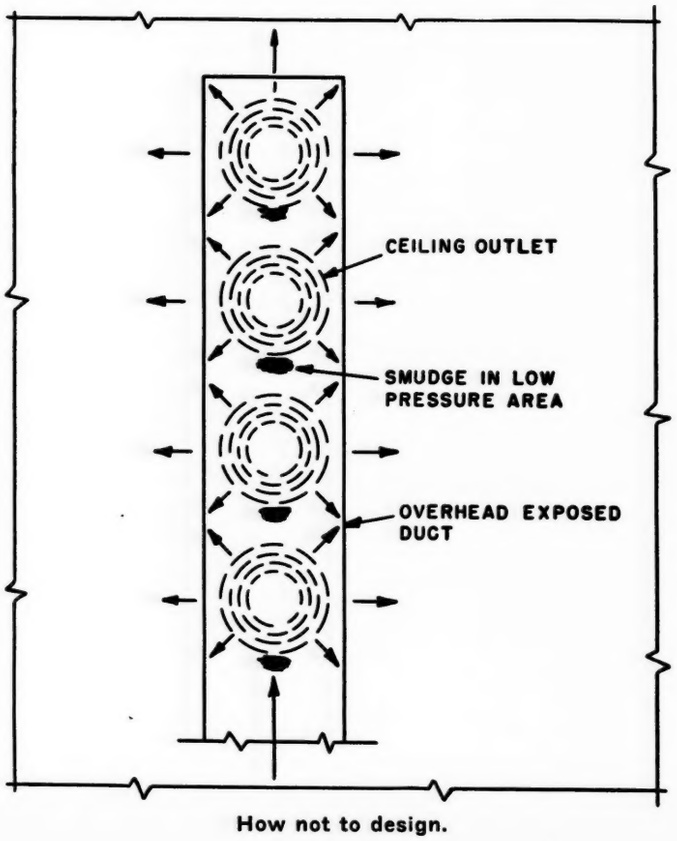
Experience is my Classroom

By T. W. REYNOLDS

• HOW NOT TO DESIGN

Sometimes I think a good book on how not to design would be a valuable addition to the college curriculum even though a seemingly backdoor approach to education. As things go we have to design first in order to learn how not to design. Thus, if there is a wrong way to do a thing humans will find it. Witness the accompanying sketch wherein all of the ceiling supply outlets leave a dark smudge on the ceiling and curiously enough always on the same side of the outlet. Originally, only alternate outlets were installed, but as the cooling effect was not satisfactory, additional outlets of another make were added. Still the inadequacy remained, for the system lacked refrigeration capacity rather than air capacity.

Aside from the need of more refrigeration, the system needs deflectors in each outlet to equalize the flow of air over the face of the outlet. Dirt is in the room air (this is a cafeteria) and dirt smudges only where it impinges, which is on the ceiling, and naturally this at the low pressure side of the outlets, regardless of the type of outlet used. Smudge and poor distribution result. However, in so far as smudge is concerned, this problem can now be met in a practical way by a recent type of outlet whose air flow pattern can be readily changed at will to miss the ceiling altogether.



How not to design.

• AIR CONDITIONING—ALL OR NONE

One designs an air conditioning system totaling 35 tons at usual design conditions (no peaks), and then the owner arbitrarily cuts its capacity to 20 tons. This he does solely on the reasoning that money being tight and engineers being conservatively liberal the system will be satisfactory most of the time, especially so when he has a similar space (so he thinks) with only 20 tons of refrigeration. Of course, the other space has a different internal and external load, but such things are of no concern to one who has overcome some big obstacles in the successful running of his own business. Such things, he feels, are important only to the engineer with a narrow viewpoint and concern with details.

Cutting 35 tons to 20 tons is a cut to 57% of required capacity. In other words, the owner says that if we are uncomfortable we will only be so 43% of the time. He is not aware that it doesn't work out precisely this way, but that when plotted hour by hour it may be uncomfortable for 60% of the time. Again, he forgets that he should add to this percentage the time the system will not take the peaks, even if of 35 tons capacity.

In the final analysis, it seems a pity to invest so much money in a system that will deliver comfort on so few occasions, and that these few occasions are the times when we least need comfort.

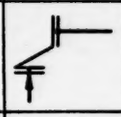
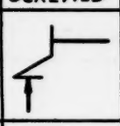
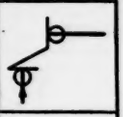
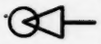
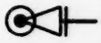
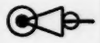
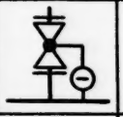
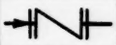
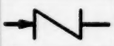
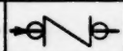
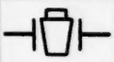
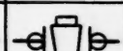
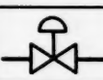
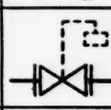
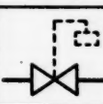
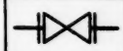
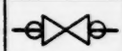
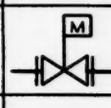
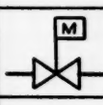
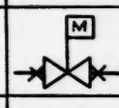
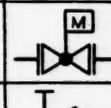
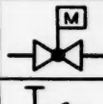
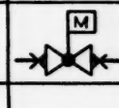
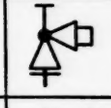
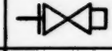
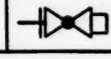
• THE EGG CRATE CEILING

The modern sub-ceiling in stores and elsewhere, known as and resembling an egg crate, need not create any problem to air conditioning engineers. The crate is made with removable sections, with squares of 3 inches, 8 inches, or other dimensions, and with return air inlets above or below it, although more safely below. Ceiling diffusers installed out of sight above the egg crate will properly diffuse the air and get it down to the occupants through the egg crate. Should one, however, have doubts, he can install a ceiling diffuser of the type whose air pattern can be varied at will to drop air more directly to the floor below.

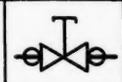
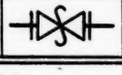
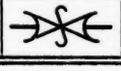
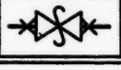
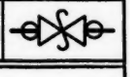
Note: Mr. Reynolds is Chief, Air Conditioning Division, Abbott, Merkt & Co., Engineers, New York.

AMERICAN STANDARD GRAPHICAL SYMBOLS – VALVES

The accompanying symbols were designated as an American Standard in May, 1949, by the American Standards Association, sponsoring organizations being The American Society of Mechanical Engineers and American Institute of Electrical Engineers.

NAME OF VALVE	FLANGED	SCREWED	BELL & SPIGOT	WELDED	SOLDERED
ANGLE VALVE, CHECK					
ANGLE VALVE, GATE (ELEVATION)					
ANGLE VALVE, GATE (PLAN)					
ANGLE VALVE, GLOBE (ELEVATION)					
ANGLE VALVE, GLOBE (PLAN)					
AUTOMATIC BY-PASS VALVE					
AUTOMATIC GOVERNOR-OPERATED VALVE					
AUTOMATIC REDUCING VALVE					
CHECK VALVE, STRAIGHT WAY					
COCK					
DIAPHRAGM VALVE					
FLOAT VALVE					
GATE VALVE (Also used for general STOP VALVE symbol when amplified by specification)					
GATE VALVE, MOTOR-OPERATED					
GLOBE VALVE					
GLOBE VALVE, MOTOR-OPERATED					
HOSE VALVE, ANGLE					
HOSE VALVE, GATE					
HOSE VALVE, GLOBE					

AMERICAN STANDARD GRAPHICAL SYMBOLS – VALVES AND PIPING

NAME OF VALVE	FLANGED	SCREWED	BELL&SPIGOT	WELDED	SOLDERED
LOCKSHIELD VALVE					
QUICK-OPENING VALVE					
SAFETY VALVE					

PIPING

AIR CONDITIONING

BRINE RETURN	—— —BR— ——
BRINE SUPPLY	——— B ———
CHILLED OR HOT WATER FLOW (Circulating)	——— CH ———
CHILLED OR HOT WATER RETURN (Circulating)	—— CHR ——
CONDENSER WATER FLOW	——— C ———
CONDENSER WATER RETURN	—— CR ——
DRAIN	——— D ———
HUMIDIFICATION LINE	—·— H —·—
MAKE-UP WATER	—·———·—
REFRIGERANT DISCHARGE	——— RD ———
REFRIGERANT LIQUID	——— RL ———
REFRIGERANT SUCTION	—— RS ——

HEATING

AIR RELIEF LINE	—-———-—
BOILER BLOW-OFF	——— ———
COMPRESSED AIR	——— A ———
CONDENSATE DISCHARGE	-o—-o—-o—
FEEDWATER PUMP DISCHARGE	-oo--oo--oo-
FUEL-OIL FLOW	——— FOF ———
FUEL-OIL RETURN	—— FOR ——
FUEL-OIL TANK VENT	—— FOV ——
HIGH PRESSURE RETURN	//— — //—
HIGH PRESSURE STEAM	//——— //—
HOT WATER HEATING RETURN	————
HOT WATER HEATING SUPPLY	———

LOW PRESSURE RETURN	— — — —
LOW PRESSURE STEAM	———
MAKE-UP WATER	—·—·—
MEDIUM PRESSURE RETURN	/— — /— —
MEDIUM PRESSURE STEAM	/——— /

PLUMBING

ACID WASTE	ACID
COLD WATER	—·—·—
COMPRESSED AIR	——— A ———
DRINKING WATER FLOW	—·—·—
DRINKING WATER RETURN	—··—··—
FIRE LINE	—F——F—
GAS	—G——G—
HOT WATER	—··—··—
HOT WATER RETURN	—···—···—
SOIL, WASTE, OR LEADER (Above grade)	———
SOIL, WASTE, OR LEADER (Below grade)	————
VACUUM CLEANING	—V——V—
VENT	———

PNEUMATIC TUBES

TUBE RUNS	═══

SPRINKLERS

BRANCH AND HEAD	—o——o—
DRAIN	—S——S—
MAIN SUPPLIES	——— S ———

Sizing Expansion Tanks for Hot Water Heating Systems

GEORGE P. JANKAUSKAS
Office of V. L. Falotico and Associates
Consulting Engineers, Brooklyn, N. Y.

THE capacity V of the expansion tank required (see Fig. 1) for a hot water heating system and the air volume V_2 of a cold system is expressed by the following isothermal equation:

$$V = \frac{P_2}{P_1} V_2 \qquad (1)$$

The air volume for a hot system V_3 is expressed by the basic thermodynamic gas equation

$$\frac{P_2 V_2}{T_2} = \frac{P_3 V_3}{T_3}$$

but $V_3 = V_2 - E$, so that

$$V_2 = \frac{E}{1 - \frac{P_2}{P_3}\frac{T_3}{T_2}} \qquad (2)$$

Substituting this value of V_2 in equation (1), we have

$$V = \frac{\frac{P_2}{P_1} E}{1 - \frac{P_2 T_3}{P_3 T_2}} \qquad (3)$$

But $\frac{P_2}{P_1} = 1 + 0.0295H$

Where 0.0295 is the conversion factor from feet of water to atmospheres, and since $P_1 = 14.7$ psi,

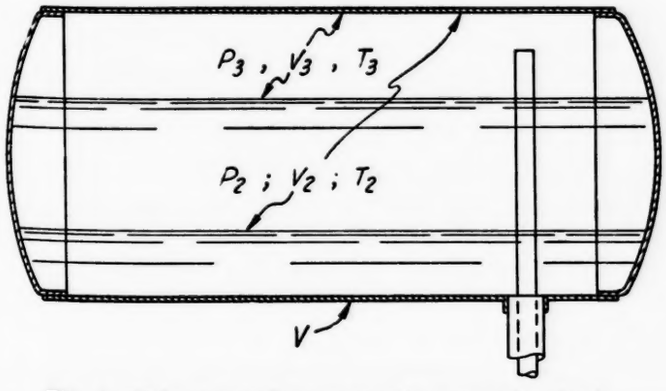


Fig. 1. Volumes and pressures in expansion tank, hot and cold periods.

Symbols
(Also see Fig. 1)

V = Tank capacity, gallons
P_1 = Atmospheric pressure (14.7 psi abs.)
P_2 = Water pressure due to head above tank, psi abs.
P_3 = Final total pressure in tank, psi abs.
H = Head of water in system above tank, feet
T_w = Absolute water temperature in tank, hot system, = 460 + 210 = 670F abs.
T_2 = Absolute air temperature in tank, cold system, = 460 + 75 = 535F abs.
T_3 = Absolute average air temperature in tank, hot system, $= \frac{T_w + T_2}{2} = 602$F abs.
V_2 = Air volume in tank, cold system, gallons
V_3 = Air volume in tank, hot system, gallons
W = Water volume in system, gallons
E = Expansion volume of water, gallons = 0.04W
1 gallon = .134 cu ft

$$P_2 = 14.7 + 0.434H$$

so that

$$P_2 \frac{T_3}{T_2} = (14.7 + 0.434H)\ 1.12 = 16.5 + 0.49H$$

where $1.12 = \frac{602}{535}$, and

Substituting in equation (3)

$$V = \frac{(1 + .0295H) \times .04W}{1 - \frac{16.5 + .49H}{P_3}}$$

From this formula, expressed in logarithmic form, Fig. 2 has been developed. The optimum tank size reference line is taken from the ASHVE data for sizing expansion tanks where

$V = 0.1W$ for a one-story building
$V = 0.13W$ for a two-story building
$V = 0.17W$ for a three-story building
$V = 0.23W$ for a four-story building

The optimum curve slopes sharply to the right and limits the maximum tank capacity to approximately one-third of the system volume. The minimum tank size reference line is arbitrarily established by limiting the maximum working pressure to 100 pounds per square inch. The tank capacity can be chosen any-

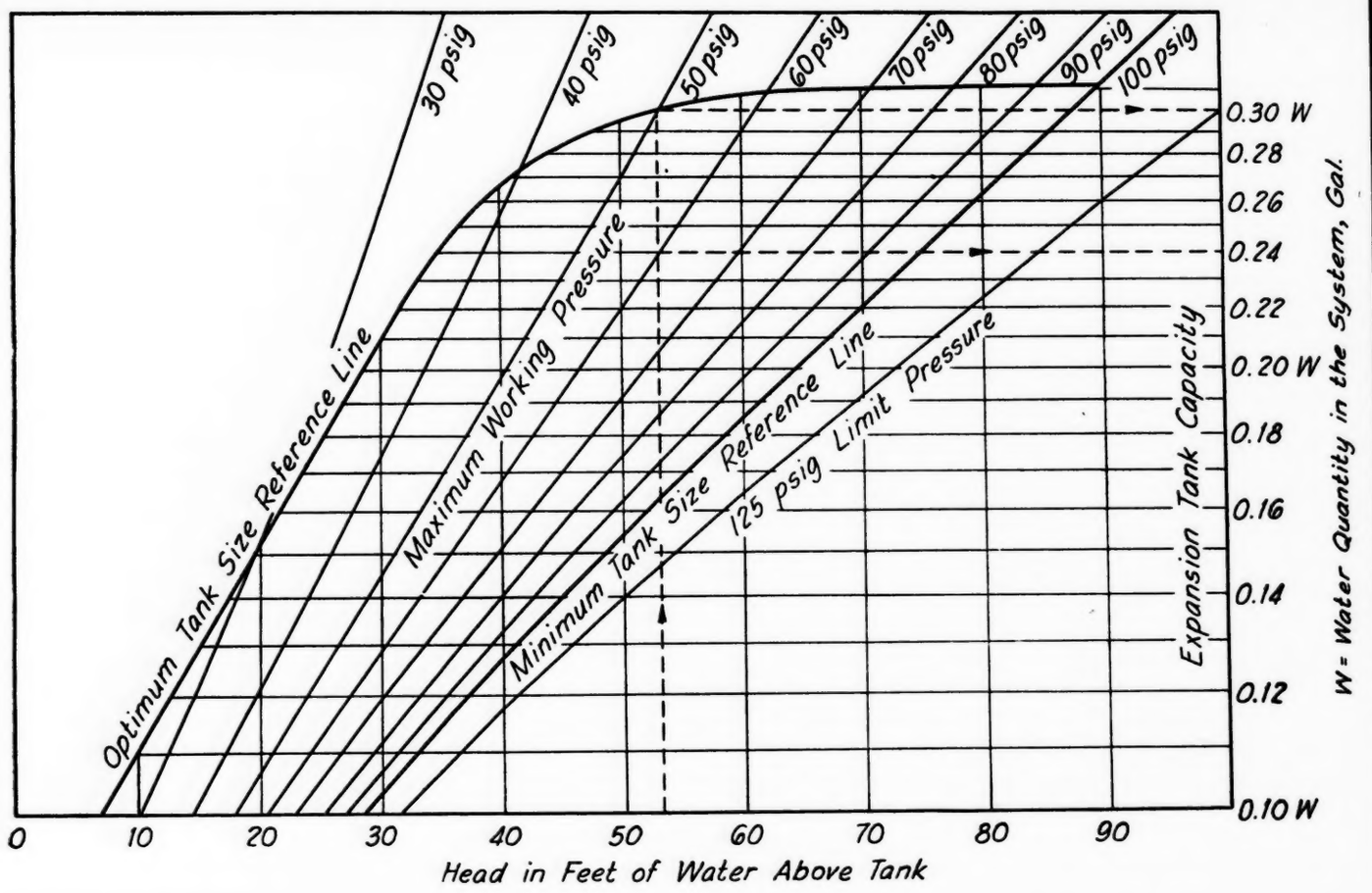


Fig. 2. Chart for determining capacity of expansion tank required for various heads, together with working pressures developed. The notation, "Maximum Working Pressure," applies to all pressure lines.

where in between the two curves and the volume and working pressure read directly from the chart.

Example. A hot water system has a head of 53 feet and a system water volume (W) of 1,000 gallons. What size expansion tank is to be used, what pressure will be developed in it, and what would be the minimum size tank that could be used?

Solution. From 53 on the horizontal scale move vertically to the optimum reference line, thence right and read 0.30W. Since 0.30W = 300 gallons, this is the recommended size tank. The intersection of the curve and the 53 line also shows the working pressure to be 50 pounds gage.

The minimum tank size is found to be 0.163W or 163 gallons, in which case the working pressure would be 100 pounds gage.

If a predetermined working pressure is selected, read to the right. For example, if 60 pounds pressure is desired, move up the 53 line to 60, thence right and read 0.24W, or 240 gallons as the tank capacity.

The safety valve pressure should be 10 pounds above the working pressure.

Pressure Reducing Valve

If the system is connected to the water supply by means of a self-filling pressure reducing valve, the reducing valve must be adjusted to the system's static pressure. If it is not, a higher working pressure will be developed in the system.

Example: What will be the working pressure in the given example with a tank size 0.3 W, if the self-filling pressure reducing valve is adjusted to 30 pounds gage?

Solution: The system's effective static head will be:

$$H = \frac{30}{0.434} = 70 \text{ feet.}$$

With 70 feet of head and 0.3 W tank capacity in the system, 71 psi gage pressure will be developed instead of 50 psi gage. This is shown by the intersection of vertical 70 feet head with the horizontal 0.3 W in Fig. 2.

Cold Filling Only

It is well to bear in mind that the pressures given are maximum pressures developed by the expansion of a system, filled cold and then heated. Any method of filling or charging the system that provides for bleeding off the expanded volume of water will result in lower working pressures, to that limit established by the head of water in the system.

If the water in the expansion tank is drained in hot condition and the heating system switched off after that, the temperature of water falls, and the pressure in the system will also fall below system's static head. As a result, the radiators in the upper floors can remain without water. On heating, radiators will be again filled with water, if the system is air-tight.

Estimating Water Discharge

JOHN D. CONSTANCE
Cliffside Park, N. J.

IN practice very often it is necessary to estimate water discharge rates of streams issuing from apertures such as fire hydrants, sludge lines and other similar exits. The flow from deep wells may similarly be estimated when no flow measuring instruments are available. All that is required is a folding rule or tape, plumb line and spirit level.

The theory behind a short-cut method of estimating discharge rates of liquid from a horizontal aperture states that when a jet of any liquid issues from an aperture whose axis is horizontal, its direction is at first horizontal, but the force of gravity immediately causes the jet to move in a curve which can be shown to be the common parabola.

In Fig. 1, let x be the abscissa and y the ordinate of any point of the jet path. The effect of the impulse due to the hydrostatic head h is to cause the distance x to be traversed uniformly in a certain time t, or, if v be the velocity of flow, $x = vt$. Theoretically (neglecting friction and viscosity) the velocity of the stream at the aperture will be $\sqrt{2gh}$.

The effect of the force of gravity is to cause the distance y to be traversed in accordance with the laws of freely falling bodies, i.e., $y = \frac{1}{2} gt^2$, where g is the gravitational constant 32. Substituting for t in the second equation, and replacing v^2 by its theoretical value, $2gh$, gives

$$y = gx^2/2v^2 = x^2/4h \qquad (1)$$

which is the equation of a parabola, the axis of which is vertical and vertex of which is at the aperture.

The horizontal range of the jet for any ordinate y is found from Equation (1). If the height of the vessel is l, the horizontal range at the plane of the base is

$$x = 2\sqrt{h(l-h)} \qquad (2)$$

This value is zero when h is zero, that is when $h = l$, and it is at a maximum when $h = \frac{1}{2}l$. Thus, the greatest range for the system in Fig. 1 is at the mid-height of the vessel.

In practice the above equations are modified by the frictional resistance of the edges of the aperture which renders the actual v less than the theoretical value $\sqrt{2gh}$. Theoretically, the time t required for a particle of water leaving any one aperture to hit the ground outside is the same as that required to reach the same level when dropped through the same vertical distance. Air resistance also reduces the value of v. However, in practice the equations may be used to estimate flow of water within acceptable limits of 10%.

Example 1: The flow in a city water system is being tested by allowing it to flow from a hydrant with an outlet four inches in diameter. The center of the outlet is two feet above the ground. The issuing stream of water fills the entire cross-section of the outlet and hits level ground at a horizontal distance nine feet from a perpendicular from the outlet to the ground, as shown in Fig. 2. How many gallons per minute are flowing from the outlet?

Fig. 2—Hydrant discharge.

Solution: From Equation (1) by rearrangement

$$v = \sqrt{\frac{x^2 g}{2y}}$$

Then substituting the proper values of x and y from Fig. 2

$$v = \sqrt{\frac{9^2 \times 32.2}{2 \times 2}} = 25.6 \text{ fps.}$$

Since $Q = Av$, where Q is quantity of flow in cubic feet per second and A is the cross-sectional area of the outlet in square feet

$$Q = 0.7854 \times 4^2/12^2 \times 25.6 = 2.24 \text{ cfs}$$

Expressed in gallons per minute,
Gpm $= 2.24 \times 60 \times 7.5 = 1{,}004$ gallons per minute.

Example 2: In a filling operation a dredge is pumping sand, mud, and water through a steel pipe 12 inches in diameter. The pipe is supported horizontally four feet above the ground. If the center of the jet from the pipe strikes the ground, as in Fig. 3, at a distance four feet away from a perpendicular from the end of

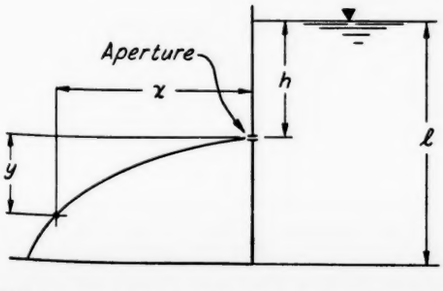


Fig. 1.—Discharge from tank.

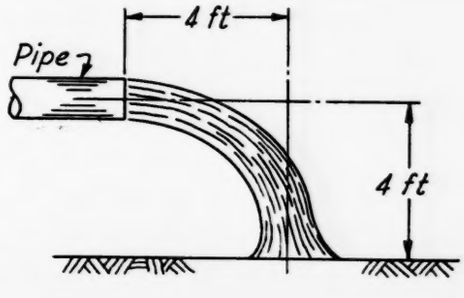


Fig. 3.—Discharge from pipe.

the pipe, how many cubic yards of mud, sand and water would be delivered by the pipe in two hours?

Solution: Here the mixture of sand, mud and water may be considered having the general characteristics of the water which is predominant. Now,

$$v = \sqrt{\frac{X^2 \times g}{2y}} = \sqrt{\frac{4^2 \times 32.2}{2 \times 4}} = 8.02 \text{ fps at outlet.}$$

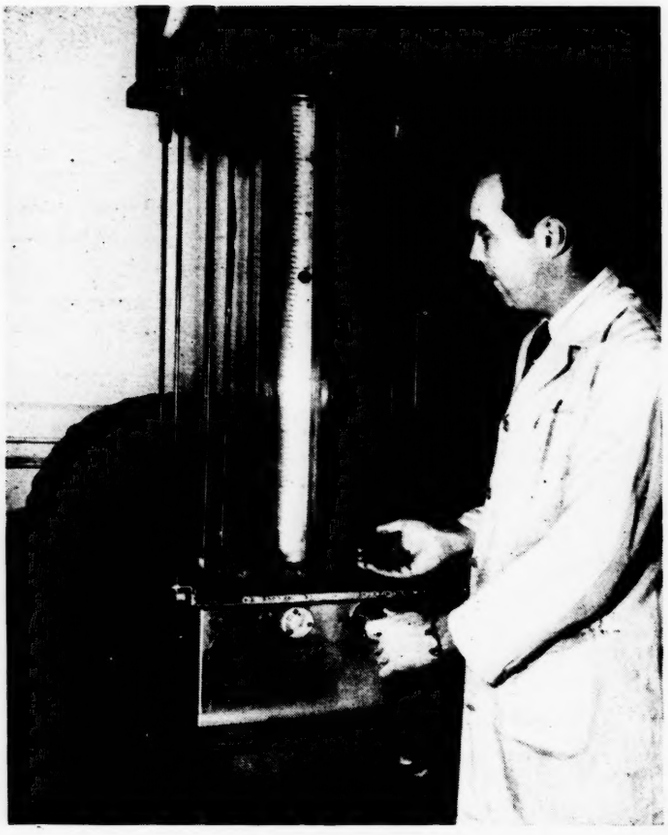
Then $Q = A\,v = 0.7854 \times (12/12)^2 \times 8.02 = 6.3$ cu ft per second, or

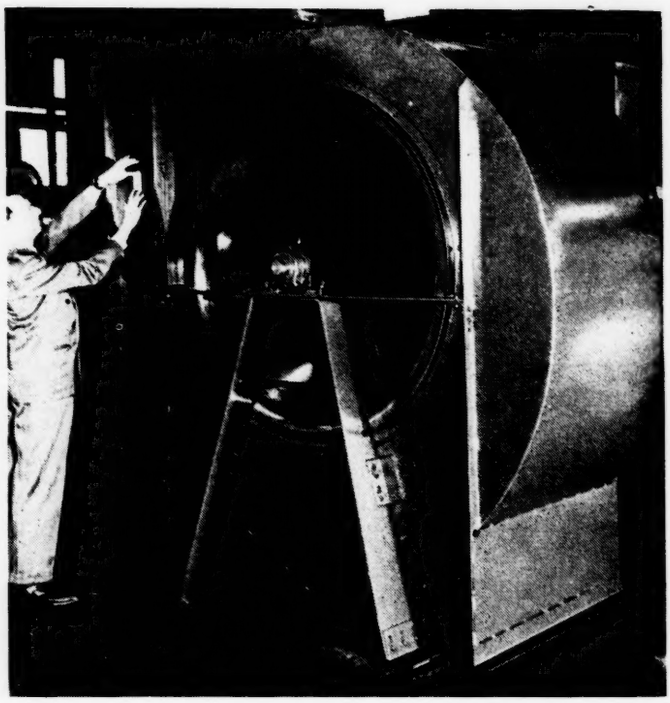
$6.3 \times 3{,}600 \times 2 \times 1/27 = 1{,}680$ cu yd in 2 hr.

Problems of this type follow the above reasoning and should be readily recognized. It would prove practical to estimate flow in everyday operations in process and power plants. By experimentally determining values for x and y for different liquids at varying flows, the above principles can readily be applied. Note in all of the above no mention has been made of pressure of the stream at the outlet.

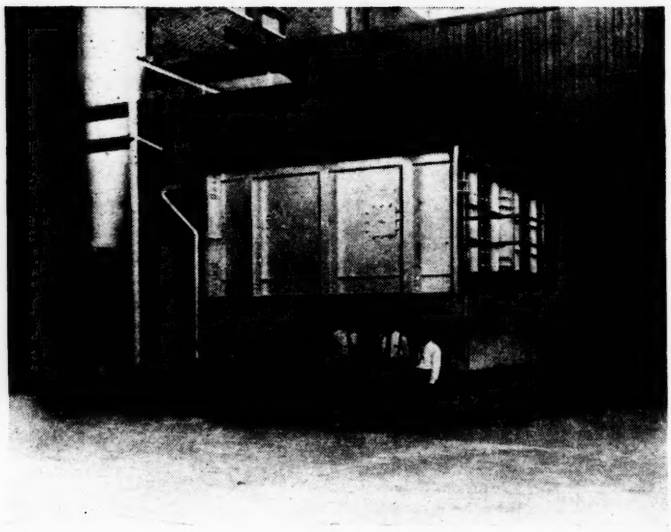
In the actual physical piping arrangement, the jet must project horizontally and the exit pipe must be level. Distance should be checked using spirit level. Another important consideration is to provide a straight run of pipe after any obstruction such as an elbow or valve. All measurements must first be taken and then the formulas applied.

Picture Paragraphs





(Above) Certified performance label being attached to the first Westinghouse Silentvane centrifugal fan produced at the Sturtevant Division, Hyde Park plant subsequent to inauguration of performance certification program. The label certifies the fan performance and is authorized by the National Association of Fan Manufacturers.



(Above, left) A scientific "pin ball" device has been developed for use by The Firestone Tire and Rubber Co. in testing resiliency of new types of rubber. Three-ounce ball bearings are dropped through sub-zero temperatures at the center of five glass tubes onto a test sample of rubber. At room temperatures, the balls bounce to the top of the tube from pure gum rubber. Resiliency at extreme sub-zero temperatures can be determined by comparing the heights to which the ball bearings bounce.

(Left) Recuperator for the first central station gas turbine installation in the U. S. This installation recently went into service at the Arthur S. Huey Station of the Oklahoma Gas & Electric Co., Oklahoma City. The recuperator, built by Combustion Engineering—Superheater, Inc., utilizes the heat in the exhaust gases from the gas turbine to heat boiler feedwater for the adjoining steam power plant. The new installation has increased the total station output by 7,000 kw.

What Happened at Dallas

Summary of the highlights at the 56th annual meeting of the American Society of Heating and Ventilating Engineers held at Dallas, and abstracts of some of the papers presented at the technical sessions.

LESTER T. AVERY, president of the Avery Engineering Co., Cleveland, Ohio, was elected president of the American Society of Heating and Ventilating Engineers at the society's annual convention held at Dallas, Tex., January 23-27.

The other newly-elected officers are: First vice president, Lauren E. Seeley, dean of the College of Technology, University of New Hampshire, Durham, N. H.; second vice president, Ernest Szekely, president, Bayley Blower Co., Milwaukee, Wis.; treasurer, Reg F. Taylor, consulting engineer, Houston, Tex.

Elected for three-year terms on the society's Council were the following:

John E. Haines, vice president, Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.; John W. James, chief research engineer, McDonnell and Miller, Inc., Chicago, Ill.; E. R. Queer, professor of engineering research, Engineering Experiment Station, Pennsylvania State College, State College, Pa.; Graeme B. Supple, sales manager, Indiana district, American Blower Corporation, Indianapolis, Ind.

K. C. Richmond, editor of *Coal Heat* was the speaker at the welcome luncheon on Monday. Dr. Umphrey Lee, president, Southern Methodist University, was the speaker at the annual banquet that was held on Wednesday evening.

The F. Paul Anderson medal of the society, awarded for "outstanding contributions in the field of heating, ventilating, and air conditioning," was presented to Dr. C.-E. A. Winslow, editor, American Journal of Public Health and professor emeritus of public health, Yale School of Medicine.

Good attendance was reported at the Southwest Air Conditioning Exposition held at the State Fair Grounds.

Following are abstracts of some of the papers presented at the convention. Abstracts of other papers were published in the January, 1950, issue of HEATING AND VENTILATING, pp 73-74.

Baseboard Radiation Performance

Five houses of varied size, shape and construction were chosen as subjects for a study, the results of which were reported in "Baseboard Radiation Performance in Occupied Dwellings," by G. S. MacLeod and C. E. Eves, respectively, test engineer and former test engineer, Sears, Roebuck and Co. Winter comfort conditions obtained were evaluated by the observation of factors of air temperature distribution, room air velocity, mean radiant temperature, and relative humidity, plus the comments of the occupants of the houses studied.

A description was given of the test equipment employed and an outline of the field test procedure followed.

The tests indicated that:

1. Size, shape, or construction materials of the structure had little effect on the overall performance of the baseboard radiation.
2. Air temperature differentials from floor to ceiling and from room to room were less than in houses heated by more conventional systems.
3. Baseboard radiation systems were free from inherent drafts.
4. Indoor relative humidity was observed to be satisfactory without the use of humidification devices.
5. Highly satisfactory results were obtained from the use of simple control systems.

Fitting Losses

A report of a study conducted under an agreement between the National Warm Air Heating and Air Conditioning Association and the Engineering Experiment Station at the University of Illinois were reported in a paper "Fitting Losses for Extended-Plenum Forced Air Systems."

The authors, H. H. Korst, N. A. Buckley, S. Konzo and R. W. Roose, are, respectively, associate professor

Newly elected officers of the ASHVE are, left to right: President, Lester T. Avery, president, Avery Engineering Co.; first vice president, Lauren E. Seeley, dean of the College of Technology, University of New Hampshire; second vice president, Ernest Szekely, president, Bayley Blower Co.; treasurer, Reg F. Taylor, consulting engineer.

of mechanical engineering, special research assistant in mechanical engineering, professor of mechanical engineering and special research associate in mechanical engineering, all of the University of Illinois.

In connection with a single size of trunk and branch duct, three general types of fittings were tested: 90 deg side take-offs, 45 deg side take-offs and top take-offs. Findings of the study were in substantial agreement with those of previous investigators.

1. Butt take-off fittings connecting a branch pipe to an extended plenum gave relatively high coefficients of loss for both side and top take-offs.

2. Conical entry decreases loss through both angle branches and 90 deg take-off fittings.

3. Reduction in sharpness of the turning angle at the entry of a fitting decreases loss through the fitting.

4. For large air quantities flowing, the coefficient of loss is practically constant. For very low values of Reynolds Number, an increase of this coefficient of loss can be expected.

5. A constant value of equivalent length cannot be designated for a particular fitting, but depends upon the quantity ratio, and to some extent upon the total air quantities.

Heat Pump Performance

A method of portraying the performance characteristics of the components of the heat pump were described in a paper on "Evaluating Heat Pump Performance," by F. R. Ellenberger, A. B. Hubbard, W. R. Foote, F. Burggraf, and J. J. Martin, Jr., all section heads of the Air Conditioning Department, General Electric Co.

The authors pointed out that it is possible to predict the performance of a heat pump system, and presented methods for evaluating heat pump performance, both analytically and experimentally.

Accurately-taken test data, the authors said, are needed to supplement performance analysis. It is particularly important in field testing to obtain sufficient data to provide an accurate indication of actual performance—rather than to take cursory measurements that do not yield true performance.

Contrary to common belief, the use of outdoor air as a source of heat for the heat pump is suitable in other than extremely cold climates. The performance analysis methods that have been presented illustrate a representative climate and show that, if supplementary heat can be made available for the relatively short periods of extremely low temperatures, the air-source heat pump can do an excellent heating job at reasonable economy.

It appears evident that new methods must be formulated for determining required heating capacity. Such factors as heat lag and thermal store in buildings need consideration. These methods may well be based upon the system of analysis presented in the paper.

Solar Heating of Houses

Results of experiments with solar heat collectors and heating units conducted during a full heating season at the Massachusetts Institute of Technology were reported by Albert G. H. Dietz, associate professor of structural engineering, department of building construction, M.I.T., and Edmund L. Czapek, research associate, department of architecture, M.I.T., in a paper, "Solar Heating of Houses by Vertical South Wall Storage Panels."

Heat collection was by water-filled 1 gal and 5 gal cans built up to fill the space behind the glass heat collectors.

The authors arrive at some interesting conclusions, based on their experiments.

1. The simplicity of the south-facing storage wall, which combines collection, storage and heating, is offset by excessive heat losses outward from the collector surface which is warm at all times, and therefore loses heat whether the wall is collecting or not.

2. The thicker the storage wall, the better its performance. However, increasing the thickness 2¼ times does not increase the efficiency proportionately.

3. The greater the heat requirement, the greater the efficiency of the storage system in terms of net solar gain.

4. Triple glass in place of double glass increases both the net solar gain and the gained proportion of the total heat requirement. The 4-inch wall with triple glass is about the same as the 9-inch wall with double glass.

5. Outward losses with the storage wall system range from 70 to 84% of the transmitted and absorbed solar energy.

6. If remote storage is substituted for the storage wall, approximately 70 to 130% of the total heat requirements can be supplied by the sun. However, periods of little or no sun may deplete the system to the point where auxiliary heat is required.

7. In spite of the relatively low performance of the storage wall, it is better than the no-storage wall.

Effective Temperature Index

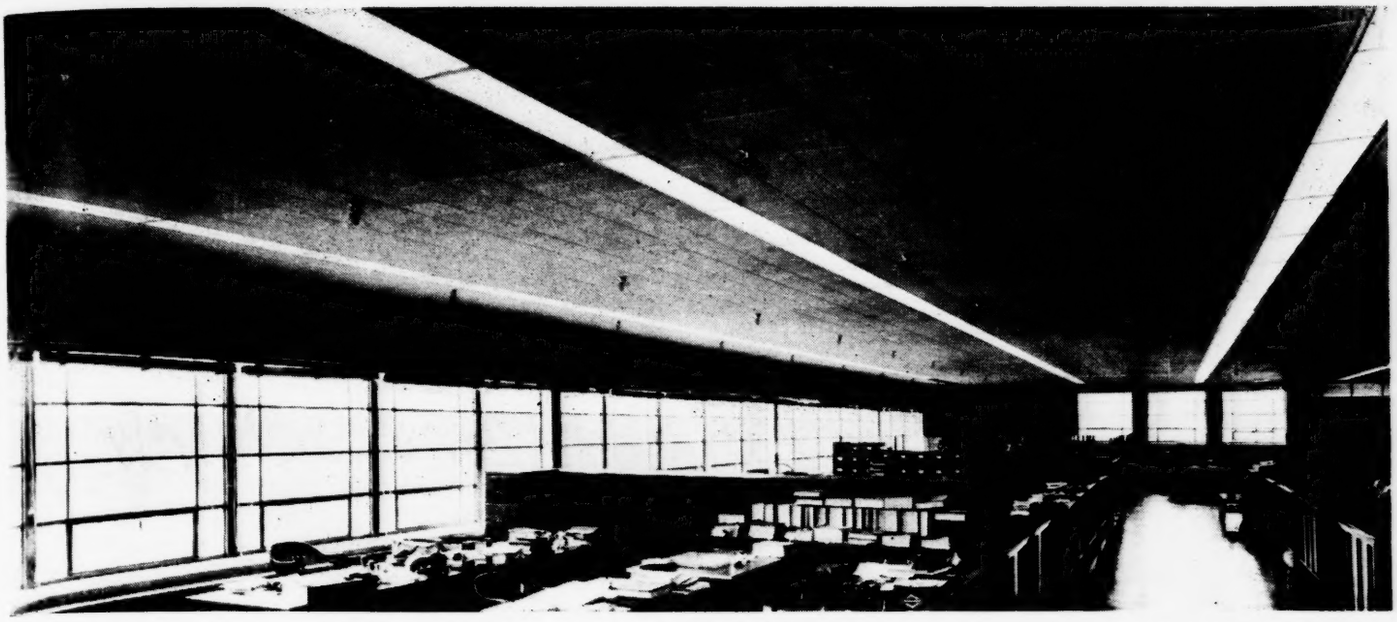
A group of investigators at the University of Illinois found that for equilibrium conditions, the present ET (effective temperature) index places too much emphasis on the influence of relative humidity.

The research was conducted by Nathaniel Glickman, Tohru Inouye, Robert W. Keeton and Maurice K. Fahnestock, respectively, assistant professor of medicine and research physiologist, research assistant, and department head, all of the department of medicine, University of Illinois, and research professor of mechanical engineering at the same university. A description of the research conducted and the results obtained were presented in a paper, "Physiologic Examination of the Effective Temperature Index."

Fifteen adult male students were employed in making the tests, and each student was subjected to two ambient environments having the same ET. Observations were made of skin and rectal temperatures, evaporative weight loss, pulse rate and thermal sensations.

Results obtained suggest that except for correction at the higher temperature, the present ET index is adequate for subjects in the dynamic state, wherein subjects passed back and forth between conditioned

(Continued on page 120)



Diffuser outlets and return grilles are completely concealed behind perforated facing of acoustic metal ceiling in general office.

A Case History of

Draftless Air Diffusion In Air Conditioning

W. H. McCAULLY
Engineering Systems, Chicago

Perforated metal, large-area diffusers and careful zoning with independent controls are design elements in the air conditioning system of the administration wing of a large warehouse. Facing of an acoustic metal ceiling is incorporated into diffuser units to present unbroken ceiling surfaces.

DRAFTLESS, year-'round air conditioning is featured in administrative offices, retail store, employees' cafeteria, and auditorium comprising over 92,000 sq ft of the two-story southeast corner section of a new 18-acre warehouse in Evanston, Illinois.

The system has been in operation during an entire winter and summer, and the zoning method of supplying interior and exterior bays separately by means of large-area, low velocity, perforated metal diffusers is credited with minimizing temperature variation so that gradients within the space do not exceed one or two degrees in all seasons. An unusual feature of the installation is the use of the perforated metal facing of an acoustic metal ceiling for both supply and exhaust grilles in 60,000 sq ft of general office floor space.

The building is the property of Hibbard, Spencer, Bartlett, and Co., hardware wholesalers, and was designed by Engineering Systems, Chicago, who also designed the heating and air conditioning system. Total air handled by 584 outlets in the perforated panel air distributing system in general office, retail store, cafeteria, and auditorium is 108,000 cfm, while private offices, lobby and reception and meeting rooms account for almost as much again.

The summer air conditioning system is designed to maintain 80F dry bulb and 50% relative humidity inside when the outside temperature is 95F D.B. and 75F W.B. Winter design conditions are 70F D.B. and 35% R.H. with —10F outside.

General Office

General office space on the second floor occupies 60,000 sq ft and requires 72,861 cfm conditioned air supply. Both supply and return air is handled through 424 diffuser panels completely concealed above metal acoustical ceiling by removal of acoustical padding from the perforated metal pans making up the facing of those sections of the ceiling directly below each panel. The perforated metal pans replace the distribution plate normally supplied with the air handling unit. In this way, a uniform ceiling surface is maintained. All supply is through sheetmetal ducts above the ceiling which supply 306 diffuser panels divided among

six zones. Each zone is controlled separately on both heating and cooling cycles by thermostatic settings which vary entering air temperatures by booster heating and cooling coils. Finned radiation under windows on exposed walls carries the basic heating load.

The method of handling exhaust and return air in general office space is unique in that additional panels in the ceiling remove air into an exhaust plenum above. About 10 ft separate supply and exhaust panels. There is no indication of short circuiting and the advantage of the arrangement lies in the fact that, with large panel areas used for supply and exhaust, no high velocities develop around the outlets.

After a year's operation, it is impossible to locate visually the metal panels through which supply and return take place because of the cleanliness of the system. It is also impossible to locate supply and return panels by draft unless one climbs up close to the ceiling.

Retail Store

The retail store occupies about 15,000 sq ft in the southeast corner of the ground floor. Air distribution of 9,521 cfm is of the hot-cold deck type in which plenum chambers above the ceiling and 68 diffuser panels set flush in the plaster ceiling are used. Plenum chambers are divided with external bays zoned separately from internal bays so that heat gains and losses near outside walls may be controlled at the source. All zones are designed to provide a constant volume of air, and entering air temperature in each zone is controlled separately by thermostat settings. Exhaust and return air is removed through side wall grilles on the west and north walls. About 38% of return air is recirculated.

Cafeteria

The cafeteria, west of the store, occupies about 9,000 sq ft with 13,075 cfm supply air. An acoustical metal ceiling is suspended below branch ducts leading to 41 diffuser panels supplying the external bays. Internal

Cafeteria features diffuser outlets concealed behind acoustic metal ceiling, 100% makeup air, wall-mounted finned radiation under windows.

Conditioned air supply for private offices is through acoustic metal ceiling.

bays receive air directly from the plenum through the panels. The standard prefabricated metal pans which comprise the facing of the acoustical ceiling are used as conditioned air outlets here also. Air is exhausted over the steam tables and serving counters and through the kitchen to the outdoors, while 100% makeup air eliminates steam and cooking odors from the dining area. Economy was achieved by using the same source of conditioned air normally used for large conditioned office space on the floor above. When employees leave the office during lunch hour, the conditioned air normally supplied to the office section is diverted to supply the cafeteria.

Auditorium

A 7,940 sq ft auditorium with a 20-ft ceiling is supplied with 12,485 cfm of conditioned air through 51 diffuser panels installed flush with the plaster ceiling. Three sheetmetal ducts supply the outlets. Ducts run longitudinally along two sides and the middle of the ceiling. Air is exhausted from two large grilles located in the ceiling at the rear of the room. The system uses 100% outside air delivered at constant volume. When the auditorium is not in use, the system is turned off, and during cold weather direct radiation is used to maintain stand-by conditions.

A Carrier centrifugal compressor delivers 341 tons of refrigeration in summer. Booster heating and cooling coils are by American Blower Co. Steam distributing tube type direct radiation is Vulcan fin tube. Conditioned air outlets are Pyle-National Multi-Vent panels as are ceiling return grilles in the general office space.

• The earth is an adaptable source of heat for homes in the Chicago area, according to R. A. Budenholzer of Illinois Institute of Technology. In Chicago an area equal to 75 ft by 75 ft is sufficient for a heat withdrawing coil capable of supplying the needs of a six-room home. The coil should be approximately 1,000 ft long and buried at least five feet deep. Individual lengths of coil should be spaced not less than five feet apart.

NEWS OF EQUIPMENT AND MATERIALS

Included in the following pages of this department are descriptions of new equipment exhibited for the first time at the Southwest Air Conditioning Exposition held at Dallas, Texas, not previously described in this department. Such items are marked "Exhibited at Dallas Show."

Electromaze

NAME—Electromaze.
PURPOSE—Electrostat precipitator to remove smoke and other foreign material from air.

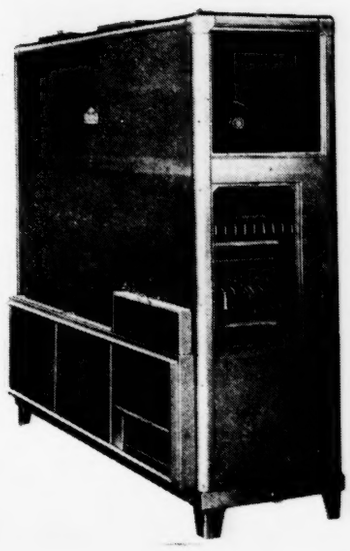
FEATURES—Filter cells are constructed of aluminum alloy with the exception of diffuser plate, ionizer-collector plates and ionizing wire holder. The diffuser plates and ionizer-collector plates are heavy plated sheet steel. Use of a single high voltage in both ionizer and collector permits unitized construction. Each cell is a complete filter in itself. A standard cell measures 12 inches high, 12 inches wide and weighs 20¾ lb. Two other sizes are available. Each cell and rectifier slide in and out of frames like desk drawers and automatically make or break the electrical connections. Cell can be easily removed for inspection or servicing. All high voltage wiring is inside a duct because the power pack is part of filter assembly. Treated steel frames bolt together to form banks for holding any combination of cells. A unit requires 115-volt a-c, 60-cycle, single-phase power. In large installations, 15,000 cfm or over, each filter cell requires about 3½ watts at 115 volts a-c or approximately 10.5 watts per 1,000 cfm. Each power pack has sufficient electrical capacity to power 50 12-inch filter cells.
LITERATURE AVAILABLE—Bulletin.
MADE BY—*Air-Maze Corporation, 5200 Harvard Ave., Cleveland 5, Ohio.*

Exhibited at Dallas Show.

Item 32

Recold Air Conditioner

NAME—Recold air conditioner, vertical floor model.
PURPOSE—Packaged air conditioning unit for space heating or cooling.
FEATURES—Fan motor is attached to a tilting base which can be adjusted to take up the fan belt. Unit is supplied with either cleanable or throw-away type filters. Blower wheels are designed for quiet operation and to provide high efficiency. Units are available with face and by-pass dampers or with by-pass dampers only. Drip pans are hot-dip glavanized to insure long life. An atomizing spray type humidifier is available. When specified, unit is insulated with ½ inch of acoustical and thermal insulating material. Tin plated copper tubes with aluminum fins are used for rapid heat transfer. Headers are of hard drawn copper tubing. Where the suction connection joins the header a collar is drawn to provide a sleeve joint.



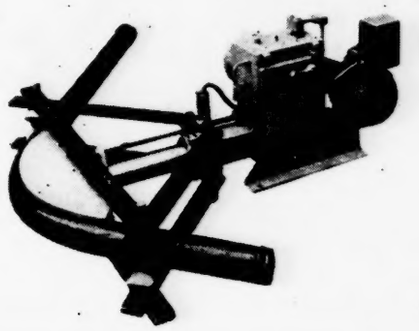
SIZES AND CAPACITIES—Available in a large variety of sizes.
LITERATURE AVAILABLE—Bulletin.
MADE BY—*Refrigeration Engineering, Inc., 7280 E. Slauson Ave., Los Angeles 22, Calif.*

Exhibited at Dallas Show.

Item 33

Greenlee Pipe Bender

NAME—Greenlee No. 785-BE 100-ton hydraulic pipe bender.
PURPOSE—For bending large size rigid conduit and pipe.



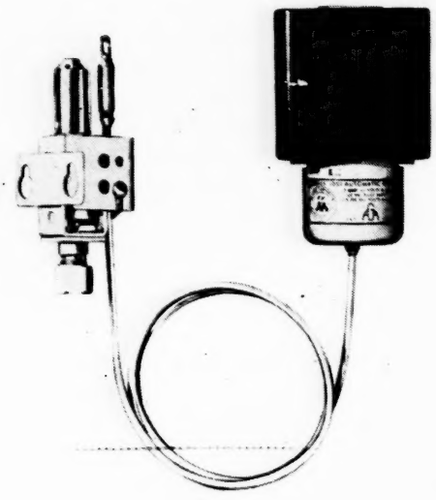
FEATURES—Unit can be provided with an electric or gasoline motor to be used on the job or in factory production. An automatic stop limits its operation when the piston reaches any predetermined distance. The stop automatically cuts off the motor. The unit has a 20-inch piston stroke, and is capable of making a 90-deg bend in a 5-inch pipe in less than 2 minutes bending time. A graduated adjustable rod is provided on which is clamped an adjustable dog that automatically stops the machine when the proper degree of bending is made.
SIZES AND CAPACITIES—For bending pipe 5 inches in diameter and smaller.
MADE BY—*Greenlee Tool Co., Rockford, Ill.*

Exhibited at Dallas Show.

Item 34

Perfex Gas Pilot

NAME—Perfex Series 1001 non-flash automatic gas pilot.
PURPOSE—A non-flash automatic gas pilot.
FEATURES—Unit employs an elec-

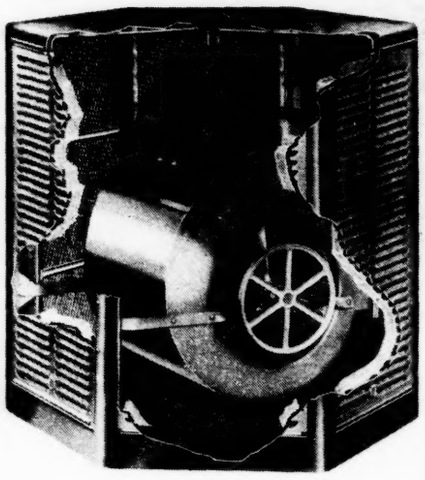


tric contact switch at a remote location from the liquid filled bulb. A feature of the non-flash design of the pilot is that gas cannot burn at the orifice. The large primary air port enables the primary air to move at a low velocity so that no dirt or foreign matter is drawn into the pilot. Makers claim that pilot burns with a clean blue flame under all field conditions and does not deposit carbon on the bulb. Pilot can be used with natural, mixed or manufactured gas by means of a simple orifice change. No air displacement is required in switching from one gas to another. A variety of mounting brackets and burner tips are available to make it applicable to all types of burners.
MADE BY—*Perfex Corp., 500 West Oklahoma Ave., Milwaukee 7, Wis.*

Item 35

Imperial Evaporative Ccoler

NAME — Imperial evaporative air cooler.
PURPOSE—For cooling homes, commercial and industrial buildings where evaporative cooling may be employed.
FEATURES—The hexagonal cabinet is said to increase cooling pad area as much as 30% to insure higher cooling efficiency. Unit is available in down discharge and horizontal discharge models. The down discharge has six removable pads and the horizontal discharge units, five pads. Easy access is provided to all parts of the unit. The down discharge model eliminates exposed duct work. Water is metered to each of six distribution troughs by a bronze positive water distribution meter at the top of the unit. Cooling pads are aspen fiber. Sag-proof cooling pad racks eliminate the need for floor binders. Unit is made of hot-dipped galvanized metal.
SIZES AND CAPACITIES — Available in eight sizes with air delivery from 4,200 to 14,400 cfm. Motor size varies from 1/3 hp for the smallest size to 2 hp on the largest unit.
LITERATURE AVAILABLE—Folder.



MADE BY—*International Metal Products Co., 500 S. Fifteenth St., Phoenix, Arizona.*

Exhibited at Dallas Show.

Item 36

Alton Evaporative Cooler

NAME—Alton evaporative cooler.
PURPOSE—Air conditioning in zones of low relative humidity where evaporative cooling cycle can be efficiently employed.
FEATURES—Unit has a heavy duty, 3-phase, 60-cycle, 220-volt motor to operate centrifugal blowers. Fiberglas filter pads are kept constantly wetted by means of a Turbospray pump assembly which is a hermetically sealed unit that requires no further lubrication. The Turbospray motor is a submersible unit which will run equally well under water as out of water. This pump recirculates the water and keeps the filter pads moist.
SIZES AND CAPACITIES—Available in four sizes from 10 to 25 tons.
LITERATURE AVAILABLE—Bulletin.
MADE BY — *Alton Manufacturing Co., 1112 Ross Ave., Dallas 2, Texas.*

Exhibited at Dallas Show.

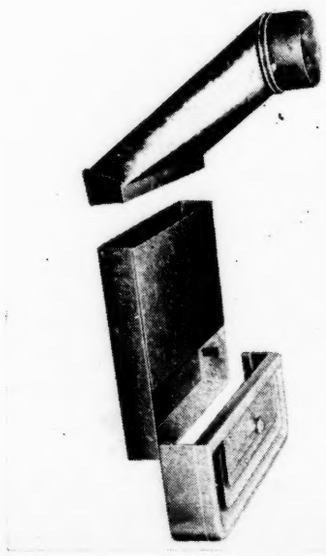
Item 37

G-E Register

NAME—G-E floor type register.
PURPOSE—A new type of floor register designed for use with the G-E air-wall heating system.
FEATURES—New register simplifies installation in existing or new houses whether of masonry or frame construction. It requires a floor opening of less than 2 inches in width. Complete assembly includes a die-cast aluminum register, a sheet metal stackhead and boot. The register directs the forced warm air upward in a wide fan-like pattern in front of the cold outer room walls and windows to supply warm air to the room and at the same time to warm the walls. While this system was designed for small one- and two-story homes with basements, it is also adaptable for basementless homes.
MADE BY—*General Electric Co., Bloomfield, N. J.*

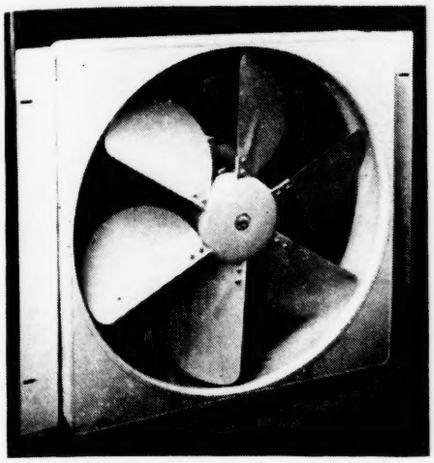
Exhibited at Dallas Show.

Item 38



Bar-Brook Window Fan

NAME — Bar-Brook window fan, Type FW-30.
PURPOSE—Room ventilation.
FEATURES—A 30-inch window fan



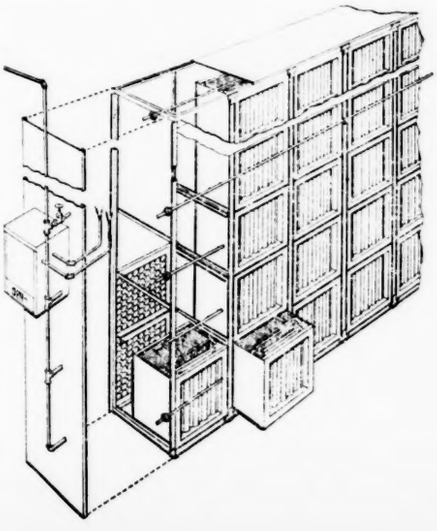
is used with a totally enclosed drive unit. Fan case is 5¼ inches thick. Unit is designed for installation in windows from 30 to 38 inches wide and to deliver 5,000 cfm air. A ¼ hp motor operates at 560 rpm. Fan comes with four installation clamps and two adjustment wings.
MADE BY—*Bar-Brook Manufacturing Co., Inc., 6133 Linwood Ave., Shreveport, La.*

Exhibited at Dallas Show.

Item 39

Trion Air Filter

NAME—Trion Electric air filter.
PURPOSE—Electrostatic air filter custom built for commercial and industrial applications.
FEATURES—Filter consists of the ionizing-collecting cell of fine tungsten wires suspended in front of and between a series of parallel aluminum plates on which the foreign particles are collected. A power pack and rectifier tubes supply the necessary high voltage current to the cell. A water wash system automatically washes away dirt from the collecting plates. Minimum water requirements are 3 gpm per 1,000 cfm at 125F during the washing cycle. A manifold is arranged to wash groups of cells, depending on the available water supply. Power is 110 to 120 volts, single phase, 50 to 60 cycle, using approximately 50 watts plus 10 watts per 1,000 cfm. Units up to and including 8,000 cfm will, upon specification, be constructed as a complete packaged unit. Placement of water inlet, power connections, drain connections, location of access door are varied according to specification.
LITERATURE AVAILABLE—Bulletin.
MADE BY—*Trion, Inc., 1000 Island Ave., McKees Rocks, Pa.*

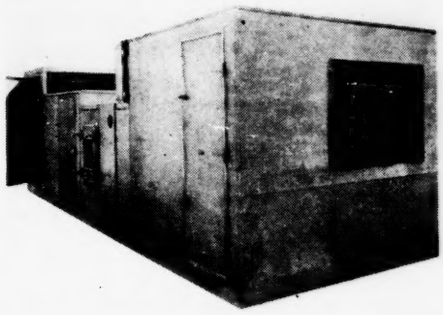


Exhibited at Dallas Show.

Item 40

Buensod-Stacey Conditioner

NAME — Buensod - Stacey central station air conditioner.
PURPOSE—Assembled unit for central station air conditioning.
FEATURES—Fan has a full housed unit made in accordance with specifications of the NAFM. Housing, which surrounds the fan section, is lined with a sound absorbing material, to absorb noise. Fan is mounted on a vibration base which, in turn, rests on the pan forming part of the fan enclosure. The second section contains a preheater coil maintained directly on top of the dehumidifier located in Section 3. In Section 3 are the spray type dehumidifier, copper cooling coil, and sprays. Four-bend eliminators remove the free water. Casing is insulated with one inch of cork; tank bottom with two inches of cork. This cork covering is protected with a sheath of galvanized sheet metal. The interior joints are used so that the unit can be mounted to the ceiling if desired. A vertical pump is used with the pump section sprayer so that no suction piping is required. Section 4 is divided with a complete casing and drain pan for electrostatic filters. Regular type filters serve the air supply to the electrostatic filters.



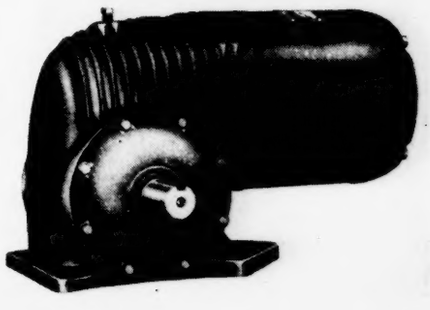
The fresh air inlet section has a large access door, and preheaters where necessary. This section also has an insulated pan and casing. Cooling coils are for either water or direct expansion.
SIZES AND CAPACITIES—Available in six sizes from 22 to 59 tons refrigeration.
LITERATURE AVAILABLE—Bulletin.
MADE BY—*Buensod-Stacey, Inc., 60 E. 42nd St., New York 17, N. Y.*

Item 41

Century Gear Motor

NAME — Century gear motor, 1½ hp.
PURPOSE—Slow speed operation for process industries and other applications.
FEATURES—Range of speeds of output shaft are from 25 to 280 rpm. Unit has only two moving parts, the armature shaft and the output shaft, and four bearings of which two are ball bearings and two roller bearings. Unit is designed for operation on single or polyphase a-c or d-c.
MADE BY — *Century Electric Co., Gear Motor Div., 1806 Pine St., St. Louis 3, Mo.*

Item 42



Sphinx Water Heater

NAME—Sphinx Model A gas automatic storage water heater.

PURPOSE—To provide domestic hot water.

FEATURES—Unit is an underfired, outside flue, automatic storage water heater provided with a steel tank heavily galvanized inside and out. The inner drum is of heavy gage steel with many spaces pressed into the drum to insure proper spacing. The outer drum is of heavy gage steel, painted inside and out with a rust-resisting baked enamel. A Bunsen-type drilled burner with raised ports is used. Burner is cast integral with mixing chamber. Heater comes with a combination thermostat and thermocouple automatic pilot which shuts off the gas supply to the main burner in the event of pilot failure. The combustion separator is a steel plate supported above the burner in the combustion chamber to insure good combustion and increased efficiency. Fiberglas insulation is used.

SIZES AND CAPACITIES — Available with tank capacities of 20, 30, 40 and 60 gal and with input ratings (manufactured gas) of 35,000 and 40,000 Btu.

MADE BY—*C. L. Bryant Corp., 4610 St. Clair Ave., Cleveland 3, Ohio.*

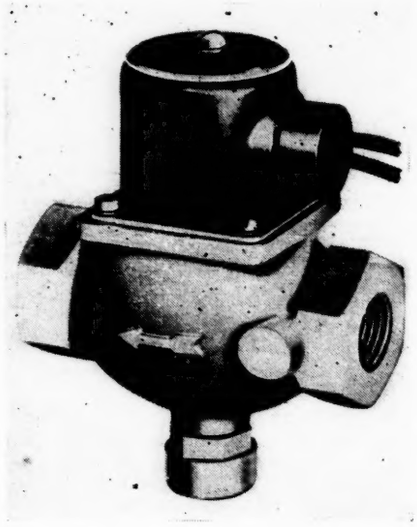
Item 43

Perfex Gas Valve

NAME — Perfex gas valve, series 3,500.

PURPOSE — Gas valve for use on space heaters, floor furnaces, unit heaters, central heating equipment and conversion burners.

FEATURES — It is claimed that greater closing pressure is achieved by the combined force of a compression spring pushing down on the plunger, a plunger assembly which is heavier than that of ordinary solenoid valves, and the pressure of the gas itself. Positive shut-off is assured by a scientifically shaped valve seat made of synthetic material which is unaffected by any gas used in heating. Added power for opening, quieter operation and elimination of hum over the entire life of the valve are obtained by use of a compact magnetic circuit which differs from ordinary valves. Valve was designed so that it can be removed easily by the serviceman.



SIZES AND CAPACITIES — Available in low and line voltage models in ½, ¾ and 1 inch sizes with or without manual opening device. Low voltage models are supplied with a transformer incorporating a built-in thermal overload switch.

MADE BY—*Perfex Corp., 500 West Oklahoma Ave., Milwaukee 7, Wis.*

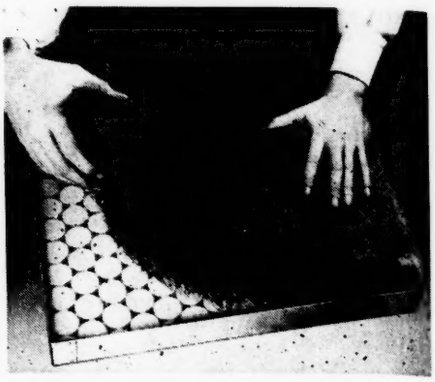
Item 44

Glasfloss Filter

NAME—Glasfloss reusable type air filter.

PURPOSE—A refill type glass fiber air filter for forced air heating, ventilating and air conditioning systems.

FEATURES—When the filter pack has accepted its capacity dust load, the light metal frame is removed from the filter bank, unfastened, and the used pack discarded. A fresh pack is inserted, the frame is re-taped with industrial tape, and the unit is then returned to the filter bank. The refill packs cost about one-third less than the conventional type now encased in single-use frames. The fine diameter of the glass fibers permits freer air passage so that the filter can be



heavily laden with dust, without clogging.

MADE BY—*Glasfloss Corp., Dept. RF, Commerce Building, New York 17, N. Y.*

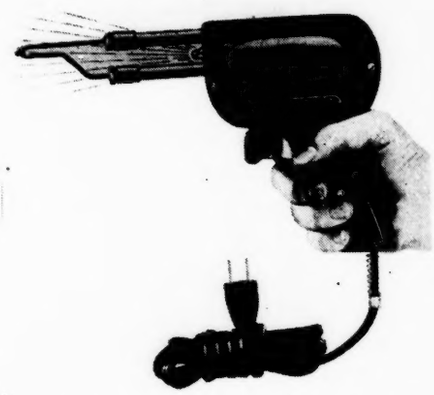
Item 45

Weller Soldering Gun

NAME—Weller soldering gun.

PURPOSE—For use with light soldering applications.

FEATURES—Soldering gun is a complete self-contained unit with built-in transmitter. It is said to reach soldering temperature in five seconds. A built-in spotlight is used



for illuminating the work. Housing is constructed of plastic.

SIZES AND CAPACITIES—Four models available, ranging in capacity from 100 watts for general lightweight duty service to 250 watts for heavy duty.

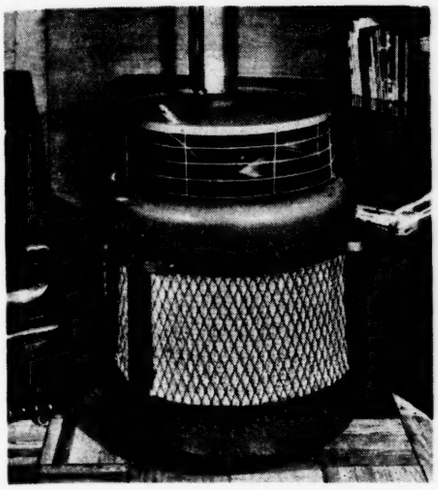
MADE BY — *Weller Manufacturing Co., Easton, Pa.*

Item 46

Climax Evaporative Cooler

NAME—Climax portable evaporative cooler.

PURPOSE — A self-contained room cooling unit functioning on the evaporative cooling principle.



FEATURES—Unit, which has a recirculating pump and a water level gage, holds 10 gal of water. A three-bladed 16-inch fan is operated by 110-volt, 60-cycle a-c current which can deliver 2,000 cfm at top speed, 1,500 cfm at medium speed and 1,050 cfm at low speed. Unit is designed to prevent spilling of water as it is moved from room to room.

MADE BY—*Climax Machinery Company, 301 S. LaSalle Street, Indianapolis 6, Ind.*

Exhibited at Dallas Show.

Item 47

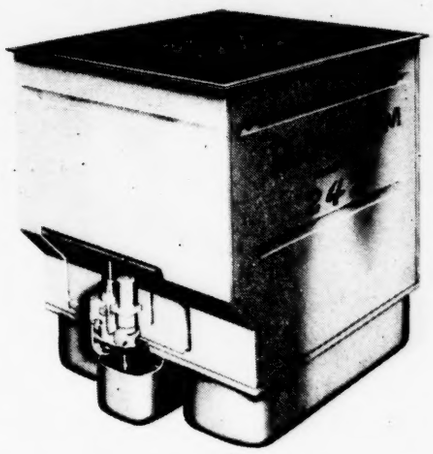
Duo-Therm Furnace

NAME—Duo-Therm floor furnace, Model 242.

PURPOSE—Gas operated floor furnace for space heating.

FEATURES—Unit, which is completely assembled at factory with the exception of draft hood and registers, is approved by the AGA. Customer has choice of a floor register or a dual wall register. Burner is made of cast iron with thirty precision slotted ports to maintain a clean, quiet flame. Tapered construction and built-in baffle are said to provide equal gas pressure and flame size at every port. A heavily ribbed heat chamber and economizer are used for the greatest amount of heat transfer. Unit has a built-in pressure regulator, automatic pilot shut-off, and an extra large pilot filter. Where desired, unit can be provided with manual control. A large service door permits the adjustment of the control, air shutter and orifices from above. Since the largest dimension is only 30 inches, only one joist need be cut for the installation.

SIZES AND CAPACITIES — Input, 35,000 Btu. Overall depth, 23½ inches.



MADE BY—*Duo-Therm Division of Motor Wheel Corp., Lansing 3, Mich.*

Exhibited at Dallas Show.

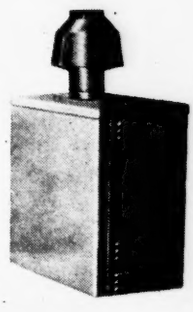
Item 48

Hydrotherm

NAME—Hydrotherm.

PURPOSE—Space heating for use with hot water systems.

FEATURES—The absorption unit has horizontal sections, deep ribbed, over-lapped and connected in zig-zag, providing a maximum heat transfer. The absorption unit is completely assembled and tested at the factory at 250 lb water pressure. Combustion is obtained through raised port cast iron burners. Orifices are of brass and are fitted into the mixer tubes which carry adjustable air shutters. Flue gases are collected by a one-piece cast iron dome and guided into an AGA type draft hood. Units are furnished with heat insulation and a jacket which encloses all controls. To facilitate installation, unit is delivered in three parts—absorption unit, jacket, and boiler base with burner and controls.



SIZES AND CAPACITIES — Available in four sizes with an input rating from 72,000 to 250,000 Btu and for supplying 288 to 1,000 sq ft direct radiation with water at 170F.

LITERATURE AVAILABLE—Bulletin.

MADE BY—*Hook & Ackerman, Inc., 18 E. 41st St., New York 17, N. Y.*

Item 49

Uni-Flo Grille and Control

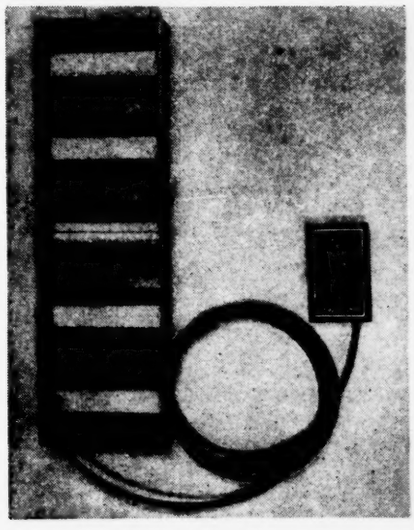
NAME—Uni-Flo grille with integral volume control.

PURPOSE—For air distribution in ventilation and air conditioning systems installed in schools and other public buildings.

FEATURES—Unit is said to combine efficient, draftless air distribution and regulation of air volume in a single unit. Air volume and direction are regulated by tamper-proof adjustments accessible from the grille face. For duct access, for cleaning and for redecoration without damaging wall surface, the grilles have removable cores. Unit has a large free area for low pressure drop and low noise level. It is supplied with a gray prime coat or in a wide selection of electroplated metal finishes.

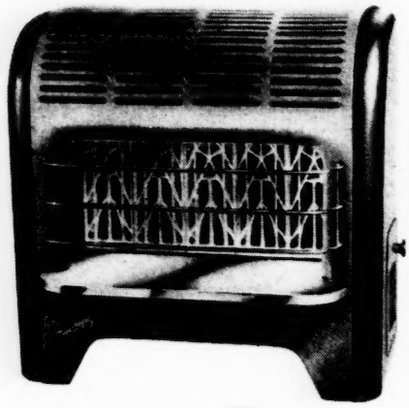
MADE BY — *Barber-Colman Co., Rockford, Ill.*

Item 50



Armstrong Heater

NAME — Armstrong radiant circulator, Model 925R.
PURPOSE—Space heating.
FEATURES—The cast iron burner is



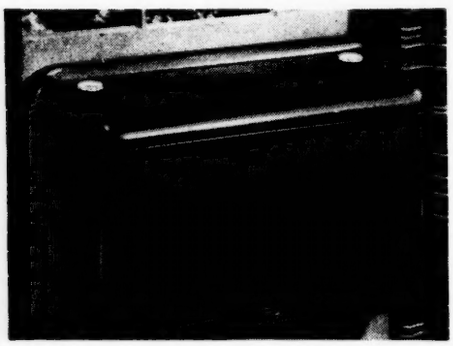
provided with a new type of air regulator designed to resist dust-closure tendencies. Valve is located behind the side access door. Although ease of operation is maintained, valve cannot be turned on unintentionally. Comfort is supplied through the use of radiant and circulating heat. Unit is AGA approved and is available for use with all approved gases.
SIZES AND CAPACITIES—25,000 Btu.
MADE BY — *Armstrong Products Corp., Huntington 12, West Virginia.*

Exhibited at Dallas Show.

Item 51

Mitchell Room Conditioner

NAME—Mitchell room air conditioner, Model M-120.
PURPOSE—Room cooling.
FEATURES—Unit is designed to provide complete air conditioning in an average size room measuring 100 to 300 sq ft providing the calculated heat load does not exceed 5,880 Btu per hr. A Dyna-Cooler



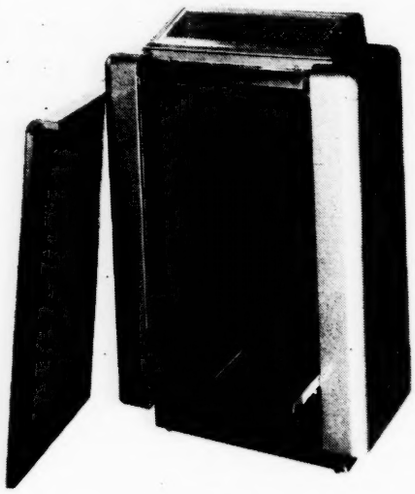
hermetically sealed motor-compressor functions with Freon-12 as the refrigerant. Replaceable filters are used. Two simple controls regulate cooling, dehumidifying, filtering, circulating, and ventilating functions. Unit is operated by ½ hp compressor.
SIZES AND CAPACITIES — Available in two models of 5,880 and 8,876 Btu. Unit measures 16½ inches high, 28½ inches wide and 26¾ inches deep and projects 10 inches into the room. Operates on standard 115-volt, 50- to 60-cycle current.
LITERATURE AVAILABLE—Bulletin.
MADE BY—*Mitchell Manufacturing Co., 2525 Clybourn Ave., Chicago 14, Ill.*

Exhibited at Dallas Show.

Item 52

Breez-E-Fex

NAME—Krack Breez-E-Fex.
PURPOSE—Floor type comfort cooler for use with remote compressor system.
FEATURES—A quiet operating slow



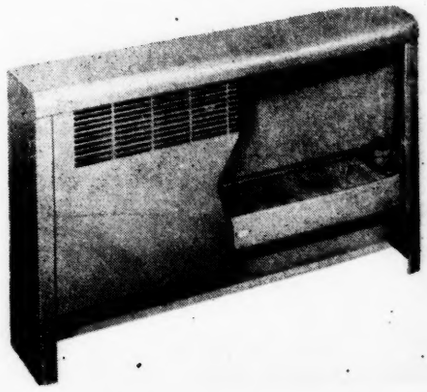
speed centrifugal fan delivers a supply of conditioned air from a remote unit. Unit cooler is insulated to prevent sweating and to reduce noise levels. Provisions for fresh air intake are made in the rear of the unit and a drain line can be run in either side or through the back of the unit cooler. Standard equipment includes a washable filter and adjustable outlet grille. This outlet grille is tilted to prevent dirt streaks from appearing on the walls. The electrical equipment is arranged as a compact, easily removable assembly consisting of motor, terminal strip, switch, etc. Oil tubes from the motor are brought to the outside of the fan panel assembly. The centrifugal type blower is both statically and dynamically balanced.
SIZES AND CAPACITIES—Available in three models with capacity ratings from 9,000 to 18,000 Btu per hr and delivery from 280 to 550 cfm.
LITERATURE AVAILABLE—Folder.
MADE BY — *Refrigeration Appliances, Inc., 901 West Lake St., Chicago 7, Ill.*

Item 53

Rittling Convector

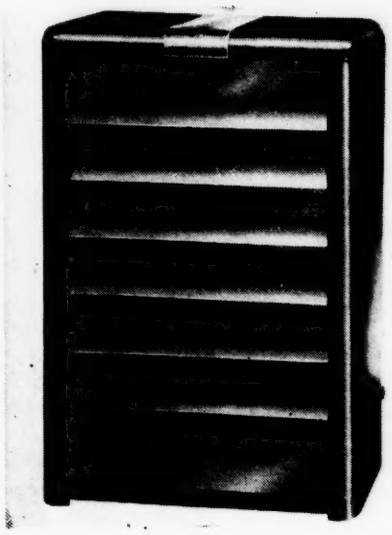
NAME—Rittling cabinet convector.
PURPOSE—Line of cabinet convectors which includes recessed, semi-recessed, free standing and wall hung types.
FEATURES—All cabinet convectors are produced in lengths of 4-inch increments from 16 to 64 inches, and for other than semi-recessed style, in 4-, 6-, 8- and 10-inch depths. Units are designed for use with steam or forced hot water systems. Heating elements have seamless copper tubes expanded into aluminum fins. Each header is provided with top and bottom fittings for ease of installation. Cabinets are made of heavy gage steel with front panels designed for easy removal. Knockouts are provided for concealed piping hookups. Wall hung units have flat top and front outlet or sloping top with top outlet.
LITERATURE AVAILABLE — Catalog BC-50.
MADE BY—*The Rittling Corp., 1298 Niagara St., Buffalo 13, N. Y.*

Item 54



Armstrong Vented Circulator

NAME — Armstrong vented circulator, series 6,000.
PURPOSE—Space heating.
FEATURES—Multiple heat exchang-



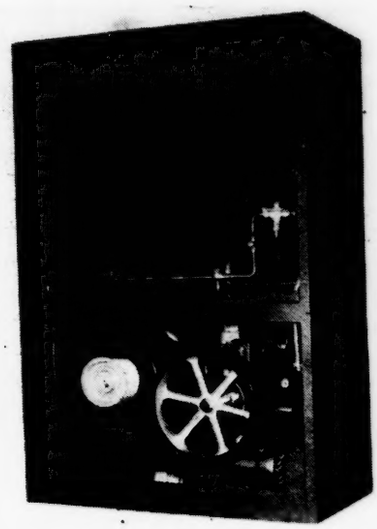
ers with individual cast iron burners are used for efficient and economical operation. Construction permits effective intake of cold air and proper diffusion of the air after it has been heated. Unit has a General Controls gas pressure regulator, a Baso shut-off automatic pilot, a Schoenberger main gas valve and a M-H thermostat control kit. Unit is AGA approved.
SIZES AND CAPACITIES—Available in two sizes with outputs of 45,000 and 60,000 Btu. Unit is 34 inches high, 16 inches deep and 22 inches wide; largest unit is 28 inches wide.
MADE BY — *Armstrong Products Corp., Huntington 12, West Virginia.*

Exhibited at Dallas Show.

Item 55

Typhoon Conditioner

NAME—Typhoon packaged air conditioning unit.
PURPOSE — Completely assembled air conditioning unit for loads from 15 to 20 tons.
FEATURES — Centrifugal fan and motor assembly is easily removed. Fan and motor assembly can be shifted to the side of the unit and the side panel placed on top. A Prop-R-Temp oversize compressor is used, said to be quiet in operation. An all copper condenser is used. Inside of the shell are installed straight lengths of condenser tube silver soldered into the tube sheets. Condensers are made with auxiliary connections so they can be converted to provide double the number of water passages for cooling tower operation. The entire control apparatus, consisting of thermostat, selector switch, pressure switch, and fan motor starter, is contained in a box mounted in the upper section of the unit. Where unit can be installed without ducts in the center of a large room, it can be furnished with a special plenum chamber with grilles for discharge in two, three or four directions. Conditioner can also be supplied with a steam or hot water heating coil for year-round operation, and also a humidifier.
SIZES AND CAPACITIES—15- and 20-ton capacity.

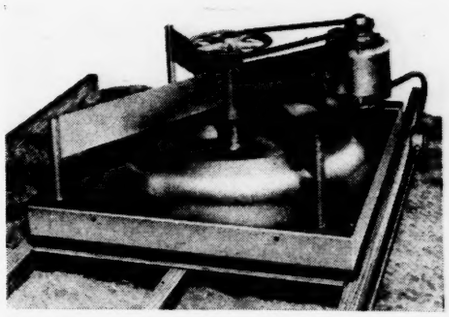


LITERATURE AVAILABLE — Bulletin 15-20.
MADE BY—*Typhoon Air Conditioning Co., Inc., 794 Union St., Brooklyn 15, N. Y.*

Item 56

Hunter Package Attic Fan

NAME—Hunter package attic fan.
PURPOSE—Attic ventilation.
FEATURES—Unit, designed for low-cost installation, has a belt-driven fan and is of the vertical discharge type which does not require a suction box. Fan is placed on attic floor. A heavy sponge rubber base provides an air seal and cushion between the fan frame and attic floor. Unit is designed for wall switch operation. An automatic ceiling shutter has a spring coun-



terbalancing device to permit the fan to open wide when the fan is operating. Shutter frame is attached to wood frame of ceiling opening.
SIZES AND CAPACITIES — Available in two models—4,750 and 6,800 cfm.
MADE BY—*Hunter Fan and Ventilating Co., Dallas, Texas.*

Exhibited at Dallas Show.

Item 57

Koldweld

NAME—Koldweld.
PURPOSE—Low-cost process of welding by cold pressure without the use of electricity.
FEATURES—Metals are joined together by pressure at room temperature without the use of either electricity or applied heat. No flux, chemical or gas is used, nor is it necessary to apply any filler metal. There is nothing to be cleaned from the welded joint. Preparation of the metals to be welded is said to be a very simple operation. Development of the process is based upon the technique of forcing metals to flow under pressure so as to produce a true weld. Success has been attained with aluminum and copper, although the process can be applied to Duraluminum, cadmium, lead, nickel and zinc. Process can also be applied to metals of any thickness from very thin foil to heavy sheets or plates.
LITERATURE AVAILABLE—Bulletin.
MADE BY—*Koldweld Corporation, 10 E. 40th St., New York 16, N. Y.*

Item 58

Western Furnace

NAME—Western Thin Boy furnace.
PURPOSE—Gas-burning furnace of small floor space designed for heating small homes.
FEATURES—Unit is delivered completely wired and assembled at the factory and is provided with a removable blower. An oversize blower wheel and rubber mounts are used for quiet operation. A Dustop Fiberglas filter is installed with mixing plenum below. Gas burner has stainless steel ribbons in a cast iron burner. The heating element is formed of 16-gage copper bearing steel. Controls include a fan and limit combination switch, room thermostat, solenoid valve, gas pressure regulator and a 100% shut-off safety pilot. The 10-inch diameter blower wheel is operated by a 1/6 hp motor. A sliding drawer facilitates removal of the blower.

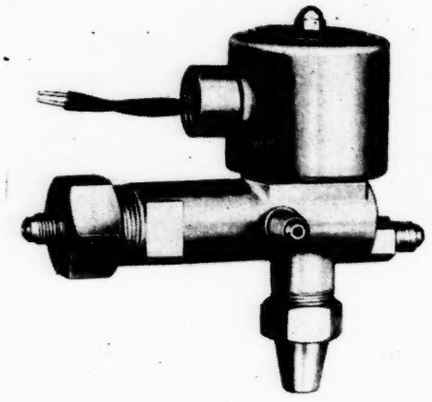
SIZES AND CAPACITIES — Output, 52,000 Btu. Unit is 14 inches wide by 28 inches deep.
LITERATURE AVAILABLE—Folder.
MADE BY—*International Sales Co., 2045 Evans Ave., San Francisco 24, Calif.*

Exhibited at Dallas Show.

Item 59

Sporlan Pilot Control

NAME—Sporlan type A-162 solenoid pilot control.
PURPOSE — Combination solenoid valve and leak port device to be used in place of large capacity solenoid valves for positive shut-off of liquid lines.
FEATURES—Unit is used as a supplementary device to thermostatic expansion valves for Freon-12 and methyl chloride installations. As only one pilot control is necessary for any one system, any number and any size of thermostatic expansion valves may be connected to one pilot control, thus simultaneously controlling the action of all valves on one evaporator or entire plant.
OPERATION—The coil is energized



either through a thermostat, pressure switch, or manual control, or by a connection across the compressor motor or starter. When the solenoid coil is energized the pilot control is open and the expansion valve functions in the normal manner, for the pressure under the diaphragm is the suction pressure. Upon closing the pilot control, by de-energizing the solenoid coil, pressure builds up under the diaphragm of the expansion valve and it is closed by the spring in the valve. This pressure is obtained through the leak port by the connection to the liquid line. It is installed in the internal equalizer connection of the thermostatic expansion valve.
MADE BY—*Sporlan Valve Co., 7525 Sussex Ave., St. Louis 17, Mo.*

Item 60

Ultralite Duct Liner

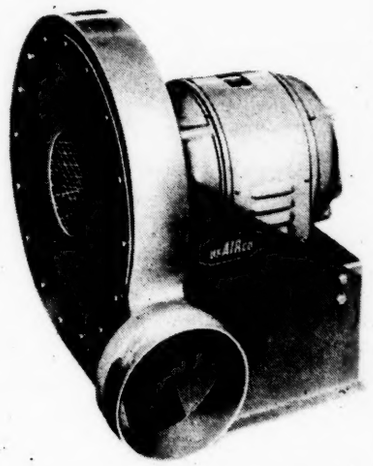
NAME—Ultralite duct liner and duct insulation.
PURPOSE—Material for duct insulation.
FEATURES—Material is composed of fine glass fibers bonded together with a thermosetting resin. Fibers form a semi-rigid insulation sheet that can be easily applied to duct work for outside insulation. A more rigid board of greater density is used as an acoustical duct-lining material. Various facings can be supplied for lining and insulating ducts such as sisalkraft paper, sisalation, vinyl film and muslin cloth. Material can be easily wrapped around square or round ducts. It is light in weight and when used with the various facing materials can be applied to concealed ducts as well as to exposed duct work.
SIZES AND CAPACITIES — Available in thicknesses from ½ to 4 inches with widths from 18 to 60 inches and roll lengths, depending on thickness, from 75 to 400 ft.
MADE BY—*Gustin-Bacon Manufacturing Co., Kansas City 7, Mo.*

Exhibited at Dallas Show.

Item 61

Turbo Blowers

NAME—U. S. Airco turbo blowers.
PURPOSE—Blowers for use in industrial stokers, oil burners, industrial ovens, and drying systems.
FEATURES — Blowers are single-stage for low pressures although

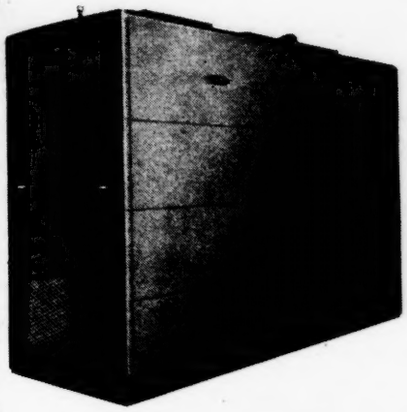


multi-stage units are available for pressures above 20 oz. Blowers operate at 3,450 rpm. Large size pillow blocks with double row, self-aligning ball bearings are used. All drives are multiple V-belt type with a high load factor for increased belt life. Spark-proof, corrosion resistant aluminum impellers are used. A special venturi inlet design and sufficient cut-off clearance at the blower outlet help, it is said, to minimize noise level at maximum efficiency.
MADE BY—*United States Air Conditioning Corp., Minneapolis, Minn.*

Item 62

Kooler-aire Air Conditioner

NAME—Kooler-aire air conditioner.
PURPOSE—Packaged air conditioning unit.
FEATURES—Refrigeration unit is



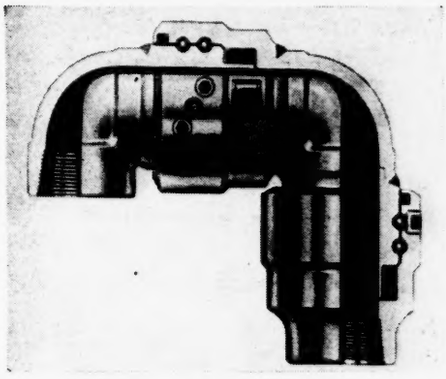
equipped with a heavy-duty compressor. Both the compressor and its driving motor are forced air ventilated. The cooling-circulating system is powered by two balanced double inlet centrifugal blowers. Impeller wheels have die-formed forwardly curved blades to deliver a high volume of air at low speed. Air is directed by blowers through the cooling coil which is a six-row staggered tube type. An evaporative condenser is built in as part of the unit. In installing, it is only necessary to make connections with electrical supply, water supply, drain and duct system.
SIZES AND CAPACITIES — Available in nine models with compressor motor ratings from 3 to 40 hp and air delivery from 1,200 to 16,000 cfm.
LITERATURE AVAILABLE—Bulletin.
MADE BY—*United States Air Conditioning Corp., Minneapolis 14, Minn.*

Exhibited at Dallas Show.

Item 63

All-Flex Coupling

NAME—All-Flex ball bearing swivel pipe coupling.
PURPOSE — Coupling designed to handle fluids under high pressures through a pipe that swivels or rotates a full 360 deg in all planes.
FEATURES—Unit is free of any projection or bolted flanges, locking rings and keys. The rotating members of the coupling are held tightly together with two sets of ball-bearings operating in flame-hardened and ground ball races. Coupling is designed for an average speed of rotation not to exceed 60 rpm. The feature that makes the coupling pressure-tight consists of two packers, each comprised of a T-shape metal backer to which a pair of synthetic rubber lips are vulcanized. Edges of the backer flare outward against the walls of the packer recess to form a full metallic seal under all pressures. High pressure couplings are made of steel, while low pressure units are made of aluminum, bronze, malleable iron or steel and are available in a wide range of sizes and for temperatures up to 225F.

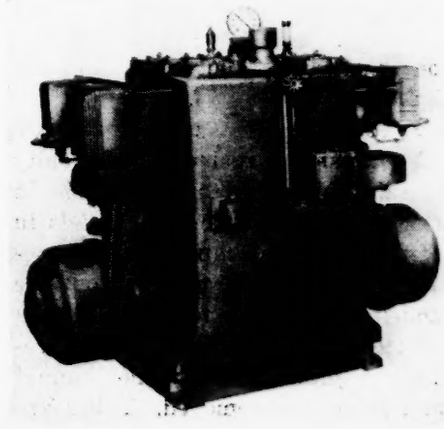


MADE BY—*Gil-Lair Products, Inc., 81 Masonic Court, Pasadena 3, Calif.*

Item 64

Compac Vacuum Pump

NAME—Compac condensate return and vacuum pump, model VE.
PURPOSE—For use in buildings and plants having up to 25,000 EDR in heating load.



FEATURES—Unit is a combination condensate return and vacuum pump using but one centrifugal pump for both functions. Vacuum is produced by use of the water jet venturi system. All parts are accessible. Unit is cast iron built, with bronze fittings throughout. Pump is sealed against air-in leakage with mechanical seals.
SIZES AND CAPACITIES — Available in many sizes of single and duplex (illustrated) units from 5,000 to 25,000 EDR.
MADE BY — *American Hydrovac, Inc., 290 Scholes St., Brooklyn 6, N. Y.*

Item 65

Insulite Board

NAME—Insulite insulation board.
PURPOSE—Insulation board for interior use.
FEATURES—Tile and plank interior board is being produced with a newly designed flange tongue-and-groove joint which fully conceals any nailing or stapling. Available in a number of pleasing shades for interior decoration. Also can be had in a number of textures and surfaces.
MADE BY—*Insulite Division of Minnesota and Ontario Paper Co., 500 Baker Arcade Bldg., Minneapolis 2, Minn.*

Item 66

Dampney Coating

NAME—Dampney silicone coating.
PURPOSE—For protecting boilers, stacks, and furnaces from weather exposure and to provide heat stability.
FEATURES—Coating has been formulated to withstand either continuous exposure to heat or intermittent heating and chilling, to a maximum of 750F, and all conditions of weather exposure. Material has good fluid consistency and a high spreading rate. It can be applied by brush or spray to any reasonably well prepared iron, steel, galvanized or other metal surface. Coverage is 1,000 sq ft per gal.
LITERATURE AVAILABLE—Folder.
MADE BY—*The Dampney Company of America, Hyde Park, Boston 36, Mass.*

Item 67

Yorkaire Conditioner

NAME—Yorkaire conditioner, Model 352.

PURPOSE — A packaged self-contained air conditioning unit for medium sized cooling applications.

FEATURES—Unit has an atmostat to pull extra moisture from the air on damp, muggy days. Four-way directional discharge grilles permit directed air flow to suit the size and shape of conditioned spaces. Built-in compressor mufflers eliminate noise from gas pulsations. The cooling section contains a York hermetic cooling system using Freon-22. It is of the 4-cylinder V-type, cooled by a deflected flow of suction gas. Blending chamber between the coils acts as a plenum to churn cooled outside and return air. Three operating controls are used. Manual adjustment of the automatic thermostat; control for alternate cooling or fan-only operation; a control that governs the atmostat. Unit has a number of protective devices. The compressor is operated by a 3 hp motor and the fan by a 1/3 hp motor. Two throw-away type filters are used. On order, heating surface and humidifier sprays can be supplied as auxiliary equipment for use with either steam or hot water.

SIZES AND CAPACITIES—Unit measures 22¼ inches by 32 inches by 82 inches high.

MADE BY—*York Corporation, York, Pa.*

Item 68

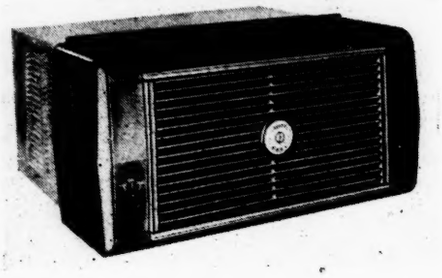
Quiet Kool Room Conditioner

NAME—Quiet Kool room air conditioner, Model G-5.

PURPOSE—Room air conditioning.

FEATURES—Refrigeration system is hermetically sealed and has oversize copper tube coils. Cooling capacity up to 5,850 Btu per hour is sufficient, it is said, for rooms up to 300 sq ft. It circulates 220 cfm and introduces 50 cfm fresh air for ventilation when desired. Cabinet is bonderized, with internal parts rust-proofed.

SIZES AND CAPACITIES—½ hp unit. Overall size 27¾ inches wide, 13½ inches high, and 25¾ inches deep. Unit extends 9¾ inches into room.



MADE BY—*Quiet-Heet Manufacturing Corp., 135 N. J. Railroad Ave., Newark 5, N. J.*

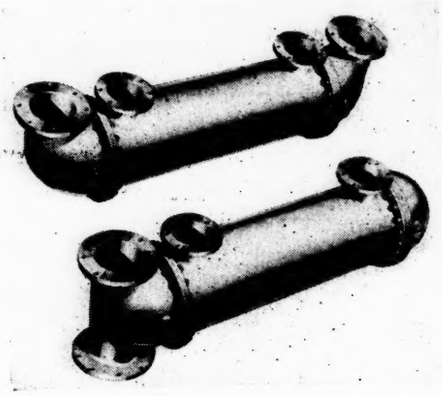
Exhibited at Dallas Show.

Item 69

Young Heat Exchanger

NAME — Young heat exchanger, designated type R.

PURPOSE—Shell and tube heat exchanger designed so that tubes can



be removed from shell in one bundle.

FEATURES — Heat exchangers are of corrosion-resistant Admiralty metal tubing and are available in both single and two-pass models in a wide range of capacities. Removable tube bundle permits outside and inside of tube to be readily inspected and maintained. Piping remains undisturbed while bonnet and tubes are removed. Tubes are rolled into header and mechanically expanded to form a sturdy joint. Baffle spacing has been designed to provide proper turbulence of fluid for maximum heat transfer.

SIZES AND CAPACITIES—Shell diameters from 8⅝ to 21 inches and tube lengths from 9 inches to 15 ft.

LITERATURE AVAILABLE — Catalog No. 1149.

MADE BY — *Young Radiator Co., Racine, Wis.*

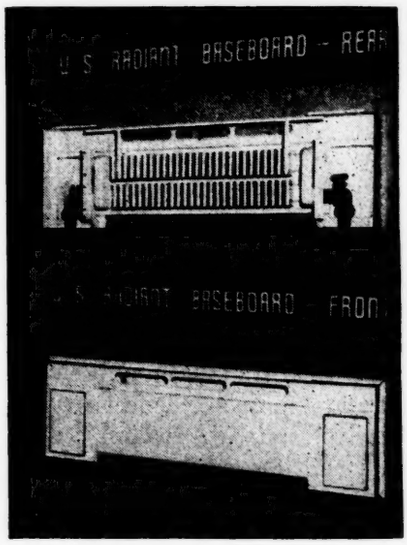
Item 70

U. S. Baseboard

NAME—U. S. Comfort Ray radiant baseboard.

PURPOSE—Space heating.

FEATURES—Baseboard may either be set against the wall or recessed



in it. If recessed in an outside wall, the wall should be insulated to a height of 18 inches behind the baseboard. As delivered, unit is provided with a special gray zinc chromate primer. Each end of unit has a ¾ inch and ⅛ inch IPS connection which also supports the unit in the pedestal mounted brackets that are supplied with each unit. Brackets are adjustable on each end from ¼ to ½ inch from the end of the coupling.

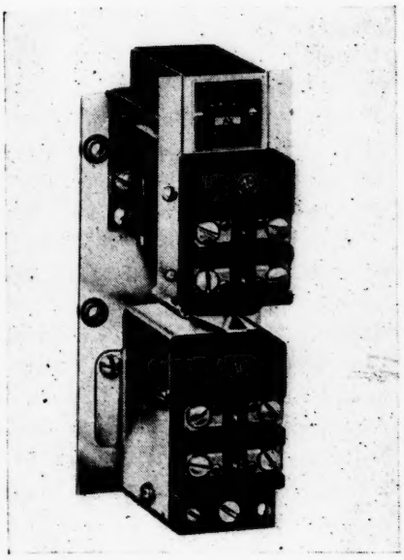
SIZES AND CAPACITIES—Available in 11 lengths from 2 to 12 ft with increments of one foot. With 180F water, rated emission is 500 Btu per lineal foot.

MADE BY—*U. S. Radiator Corp., Detroit 31, Mich.*

Item 71

A-B Timing Relay

NAME — Bulletin 849 pneumatic timing relay.
PURPOSE—An adjustable timer for use with either a-c or d-c.



FEATURES—Control utilizes a synthetic rubber bellows for controlling the tripping time. The relay resets instantaneously. Performance is unaffected by temperature, humidity or vibration. Unit is available with quick make and quick break, double pole, silver alloy contacts—one set normally open and one set normally closed. Terminals are readily accessible from the front. A duplicate set of contacts for pilot control can be provided, actuated directly from the solenoid and opening and closing instantaneously with the action of the solenoid. Unit can be changed from on delay to off delay by simply inverting the solenoid.
MADE BY—*Allen-Bradley Co., Milwaukee, Wis.*

Item 72

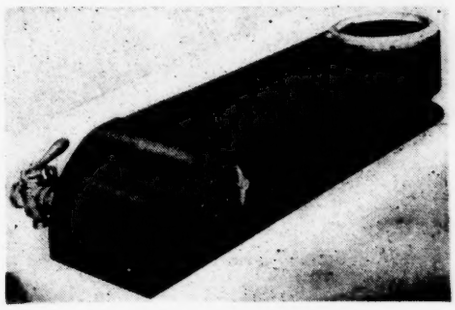
Thermopane

NAME—Thermopane window unit.
PURPOSE—Window unit combining one pane of heat-absorbing glass and one of regular polished plate glass, to cut down the transmission of solar heat.
FEATURES — The heat-absorbing glass used as the outer pane is said to absorb nearly half of the sun's heat. The bluish green tint of this glass has also proven effective in lessening glare from direct and reflected sunlight. Thermopane is formed by these two panes in a frame, separated by a hermetically sealed air space.
MADE BY — *Libbey - Owens - Ford Glass Co., Toledo 3, Ohio.*

Item 73

Zink Conversion Burner

NAME—John Zink conversion burner, luminous flame model.
PURPOSE—Conversion burner for use in converting coal-fired boilers and furnaces to gas.
FEATURES—Luminous flame is said to operate without roar or vibration. Burner, which has built-in controls concealed in the burner box, is easily installed through the ash pit door opening of a furnace with the burner head centered in the fire bowl. Luminous flame is said to make heat instantly available since no baffles are used. Pilot light assembly is located in a position to assure lighting of the main burner even though normal pressure is decreased. The complete piping, burner head and pilot assembly may be removed for inspection through the door end of the burner. Working parts may be removed and reinstalled in a few minutes without disturbing the burner duct or brickwork. Unit is available for operation on natural, mixed, manufactured, or LP gases.

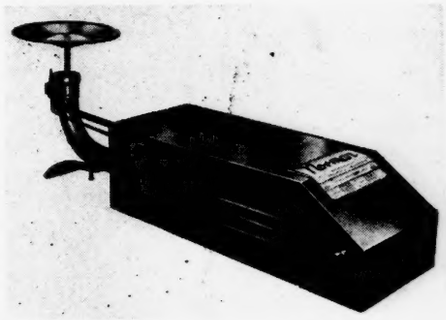


MADE BY—*John Zink Co., 4401 S. Peoria, Tulsa 1, Okla.*

Item 74

Norman Conversion Burner

NAME—Master Series NPS-3 gas conversion burner.
PURPOSE — Gas conversion burner for warm air furnace or steam or hot water boilers.
FEATURES—The unit embodies the Norman single-port, self-piloting, flame retention type burner and has a specially designed flame distributor plate. It is equipped with a



telescopic burner tube for quick centering in any shape or size firepot. Adjustable front and rear supports permit fast leveling. Quick change orifice holder permits rapid changing of orifice size to vary input. Extra orifices are supplied with each burner. Unit has a tamper-proof secondary air adjustment, and a dust-proof casing that enables easy access to all controls. Unit and controls are AGA approved.
SIZES AND CAPACITIES — Available in three sizes for natural, mixed and LP gas, ranging from 50,000 to 300,000 Btu per hr input, and two sizes for manufactured gas from 50,000 to 210,000 Btu per hr.
MADE BY—*Norman Products Company, Columbus, Ohio.*

Item 75

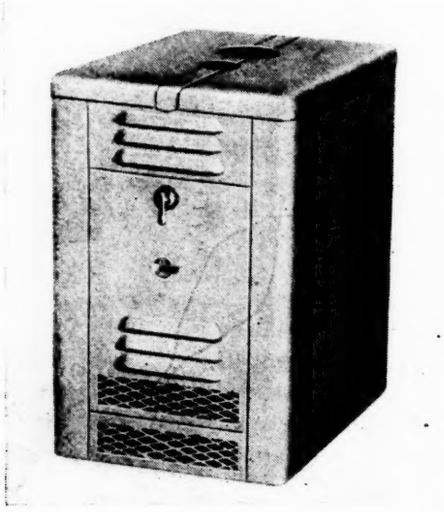
Russell Motor

NAME—Russell shaded pole motor.
PURPOSE—Four-pole shaded pole induction motor with small horsepower ratings.
FEATURES—Three styles of frames are available in ratings from 1/10 to 1/60 hp at 1,550 rpm with 60-cycle current. A drawn steel housing with self-aligning bearings is available for general applications. A die-cast housing is available with ball bearings or sleeve bearings. The third frame style is of unit bearing construction, totally enclosed with sealed lubrication.
MADE BY—*Russell Electric Co., 4501 S. Western Boulevard, Chicago 9, Ill.*

Item 76

Airtemp Boiler

NAME—Airtemp gas-fired boiler.
PURPOSE—Space heating.
FEATURES—Due to staggered horizontal cast iron sections, makers

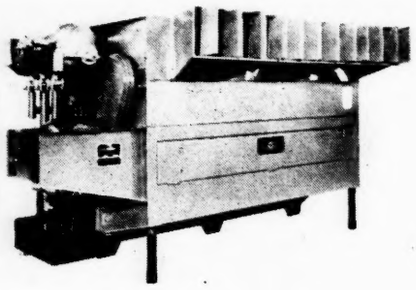


claim that great heating capacity is achieved in a compact unit. Burners for all types of gases are available. Controls are enclosed in the cabinet and may be removed without disturbing piping or electrical connections. Unit is considered to be ideal for convector, radiant or panel heating, or for use with Airtemp's packaged air conditioning units.
SIZES AND CAPACITIES—Available in sizes ranging from 47,600 to 400,000 Btu output. The small unit measures only 13 inches wide, 26 inches long and 26 inches deep.
MADE BY—*Airtemp Division, Chrysler Corp., Dayton, Ohio.*

Item 77

Niagara Fan Cooler

NAME—Niagara spray fan cooler.
PURPOSE—For installation in refrigerated rooms where high capacity is required but where ceiling height is restricted.
FEATURES — Fan section is located on the side of the unit instead of at the top as is common in conventional practice. Air enters the spray section at the top, is chilled in passing down through the spray and over the refrigerant coils, then enters the fan section at the bottom and is discharged near the top. Makers claim that this unit delivers more air at lower power consumption than do conventional vertically arranged coolers. When below freezing temperature is used, brine is employed in the spray.
SIZES AND CAPACITIES—Five sizes available with capacities ranging from 1,680 to 11,000 cfm chilled air. Floor space required ranges



from 16 to 72 sq ft. Maximum height is 72 inches.
MADE BY—*Niagara Blower Co., 405 Lexington Ave., New York 17, N. Y.*

Item 78

Fuel Oil Treatment

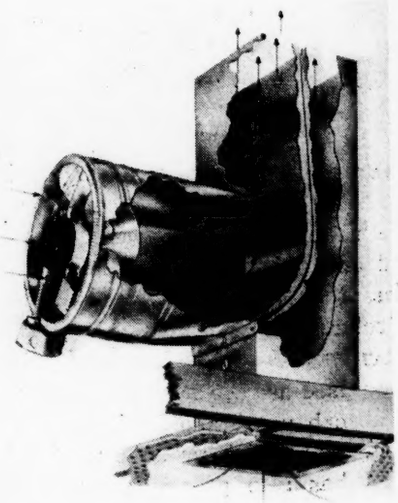
NAME—Dacarol A.
PURPOSE—An activated fuel oil treatment to attack oil sludges and water condensation.
FEATURES—Makers claim that use of this material has resulted in cleaner tanks and lines, and less carbon deposits in preheaters and on burner tips. Product is added to the storage tank content in proportion to the amount of fuel oil.
LITERATURE AVAILABLE—Pamphlet.
MADE BY—*Dacar Chemical Products Co., Pittsburgh, Pa.*

Item 79

Attifan Ventilator

NAME—Attifan dual ventilator.
PURPOSE—Single ventilating unit to serve both kitchen and attic.
FEATURES — Motor and fan are mounted in a separate duct partition, opening into the attic. Fan operation draws air from the attic and kitchen simultaneously, often resulting, it is said, in lowering room temperatures in summer by 15 to 20F. The updraft created by the sweep of air in the duct above the unit installation assures rapid removal of kitchen odors and stale air.
MADE BY—*Kool Air Engineering Company, San Bernardino, Calif.*

Item 80



FEBRUARY, 1950

TO OBTAIN FURTHER INFORMATION ON NEW EQUIPMENT

On the list below, circle the item number of the equipment in which you are interested, using the number of found at the end of each item.

32	33	34	35	36	37	38	39	40	41
42	43	44	45	46	47	48	49	50	51
52	53	54	55	56	57	58	59	60	61
62	63	64	65	66	67	68	69	70	71
72	73	74	75	76	77	78	79	80	

Print your name and address, detach and mail to
Editor, HEATING AND VENTILATING, 148 Lafayette St., New York 13, N. Y.

Name.....

Title (Must be shown).....

Firm (Must be shown).....
(For prompt service, title and firm name must be shown above.)

Business Address.....

City.....**Zone**....**State**.....2/50

NEWS OF THE MONTH

JET-TYPE ENGINES

will largely replace conventional power in non-aircraft field, Boeing executive predicts.

The jet-type engine, which already is revolutionizing the aircraft industry, also will one day largely replace the conventional reciprocating engine in many land and water vehicles and as a stationary or portable power source, Edward C. Wells, Boeing Airplane Company's vice president for engineering, predicted in a recent talk.

Gas turbines (the proper name for engines popularly known as "jets", "turbojets" or "propjets") should be readily adaptable for trucks and the propulsion of cabin cruisers, speedboats, launches and light barges, he said, adding that "the next ten years may well see the versatile new power plant beginning to supplant the piston engine in America's pleasure cars."

• **MODELS.**—Wells' observations were based on his company's successful work with two lightweight turbine engines, the Boeing Models 500 and 502.

The "500" is a 111-lb turbojet whose 180 lb of thrust make it a very efficient jet power plant. The gas-turbine "502" is nothing more nor less than the "500" with gear box, shaft and turbine wheel added. Thus the source of power is the same in each engine, but the methods of final propulsion are entirely different. The "500" produces jet power, measured in pounds of thrust; the "502" puts out shaft power, measured in conventional *horsepower*. The continuous output rating of the "502" at present is 160 hp, with a 200 hp emergency rating.

The 180-pounds-thrust Model 500 and the 160-horsepower Model 502 aren't yet ready for large-scale production, he explained, but they have passed the experimental stage and right now are ready for service tests under controlled conditions in actual industrial jobs.

• **SIMPLE.**—Basic advantages of the new-type power plants, Wells added, are simplicity of design, lightweight, small volume and ability to develop full power even when "stalled." The "502," for example, weighs only 185 pounds, thus developing virtually a pound of horsepower for every pound of weight. By way of contrast, present diesel engines of comparable horsepower weigh 2,850 pounds. Likewise, the "502" has only one-sixth as many parts as in an average piston engine of equal horsepower, and takes up much less volume.

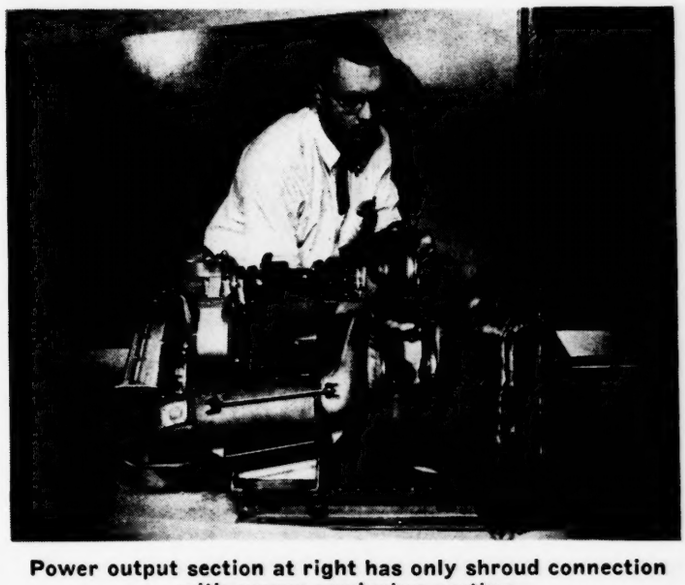
• **DEVELOPMENT.**—Boeing's turbines are a by-product of company research started in 1943 to assist in evaluation and application of jet power to new Boeing designs, including the present B-47 Stratojet bomber. To obtain needed information, Boeing engineers designed a small jet engine. It proved so significant that the project was continued, and was publicly announced in July, 1947. The Navy's Bureau of Ships has been actively interested in the program since that same year.

• **USES.**—The field of industrial standby equipment is a "natural" for the gas turbine. The "502" has the necessary horsepower, wrapped up in a small package that can be conveniently tucked away in a corner for operation of standby pumps, generators and compressors.

Because of its portability, the Boeing turbine can fill a need of long standing in such fields as mining, logging and exploration, where inaccessibility often makes it difficult to employ unwieldy piston-type power sources. It can readily be disassembled and assembled, and it can be transported easily by light airplane. It can be easily moved into position by jeep, or even carried by hand.

• **SPACE HEATER.**—The little turbine is ideally suited for portable fire-fighting equipment. And without gear

Acoustics engineers examine air filter developed to overcome compressor noise.



Power output section at right has only shroud connection with power producing section.

box and shaft, it can serve with exceptional efficiency as a space heater—either stationary or portable.

In addition to light aircraft propulsion and ground servicing, one of the turbine's most interesting outlooks is in the marine field, where research shows it readily adaptable for powering small craft: cabin cruisers, speed boats, launches, light barges.

As a prime mover for automotive vehicles the turbine's possibilities stir the imagination. True, this development will not come immediately. Nonetheless, forward-looking engineers estimate that the next ten years may well see the gas turbine beginning to supplant the piston engine in America's pleasure cars.

• **FOR TRUCKS.**—Earlier and more definite possibilities appear in the field of truck transportation. Here the turbine may fairly soon be in a position to replace the conventional diesel power plant.

GAS STATISTICS

show 1949 a record year with natural gas setting the pace.

At the end of 1949 the gas utilities were serving an estimated 23,763,400 customers, including about 334,000 LP gas customers served directly by utilities. This was an increase of 2.5% over the 23,183,000 actual customers served in 1948. Of the total number served 13,319,000 were receiving natural gas, a gain of 8%; 8,566,600 were receiving manufactured gas, a decline of 0.4%; and 1,544,300 were served with mixed gas, a decrease of 20.1%. The decline in manufactured and mixed gas customers can be attributed to change-overs by important gas utilities from manufactured and mixed to natural gas distribution.

Utility sales of natural gas during 1949 were about 3,153,335,000 Mcf, an increase of 8.9% over 2,894,650,000 Mcf sold in 1948. Manufactured gas sales amounted to 420,087,000 Mcf, a decline of 5%, while mixed gas sales decreased 8.5% to total 135,577,000 Mcf.

Total revenues from the sale of gas reached an all-time high of $1,694,331,000, an increase of 7.3% over revenues of $1,579,603,000 in 1948. The major increase occurred in the natural gas branch where revenues rose to $1,097,328,000, 10.3% over 1948. Manufactured gas revenues were $484,305,000, a rise of 4.6%, while mixed gas revenues, most affected by change-overs, declined 10.6% to total $91,958,000.

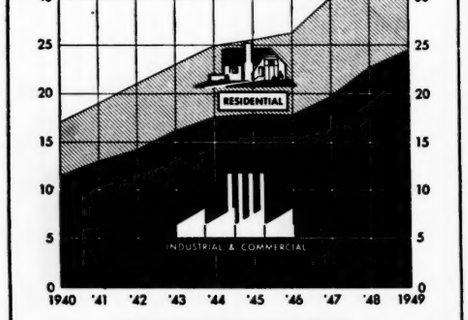
• **NEW FACILITIES.**—Expenditures for gross construction of new facilities and expansion of present facilities in 1949 reached an all-time high of $943 million, exceeding last year's peak of $770 million. The industry recently resurveyed its capital requirements for the five-year period from 1948 through 1952 and found that about $3.5 billion will be required. It is estimated that $1.8 billion will be spent by gas companies in the next three years. Manufactured and mixed gas companies expect to spend $500 million during the five-year period, with natural gas utilities spending $3 billion. Of this amount about $1.8 billion will go for new natural gas transmission facilities.

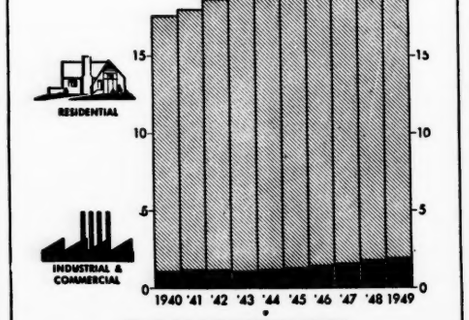
• **NATURAL GAS EXPANSION.**—For the first time in its history, New York City was served with natural gas when the New York and Richmond Gas Company of Staten Island opened its line bringing natural gas to New York from the Gulf Coast of Texas.

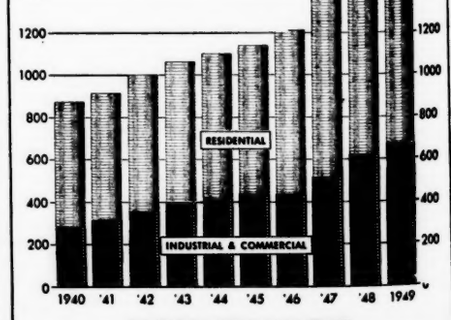
The remaining boroughs of New York will begin receiving natural gas by the end of 1950 with the completion of the 1,840 mile pipe line now being constructed by Transcontinental Gas Pipe Line Corp. at a cost of about $190 million. This line, which will run from Texas to the Hudson River, will supply 505 million cubic feet of gas daily to metropolitan New York and Newark, N. J. Applications are pending before the Federal Power Commission to increase daily deliverability by 100 million cubic feet and to extend the New York line to the New York-Connecticut border.

Several natural gas transmission companies are working on plans for bringing natural gas to the New England states. This highly industrial area now is served entirely with manufactured gas and the advent of natural gas may make important changes in the economic future of New England.

Another important extension is proposed by the







Atlantic Gulf Company which would bring a line from the Louisiana Gulf Coast to major cities in Alabama, Georgia, South Carolina and Florida.

In the six months ended June 30, 1949, the Federal Power Commission authorized construction of 4,900 additional miles of natural gas pipe line to cost about $375 million. Another 8,500 miles were under construction at the end of 1949, and applications are pending before the FPC for about 14,600 miles. The present 260,000 mile network is delivering almost three trillion cubic feet of gas annually.

Proved reserves of natural gas climbed to new high levels. The AGA Committee on Natural Gas Reserves estimated that proved recoverable reserves at the beginning of 1949 amounted to 173.8 trillion cubic feet, an increase of 7.9 trillion cubic feet over the previous year. Production of natural gas jumped from 5.6 trillion cubic feet in 1948.

WEATHER AND BUILDING

is subject of first open conference on research needs sponsored by BRAB.

More than 250 of the leading American scientists engaged in building research met January 11 at the National Academy of Sciences in Washington for a two-day discussion of the weather as it affects building problems. In the group were representatives of research laboratories conducted by private industry, colleges and universities, private foundations, and various government agencies, as well as architects, engineers and builders from all parts of the country.

The meeting is the first of a series of research correlation conferences sponsored by the Building Research Advisory Board, a new unit in the National Research Council. This was established early in 1949 as a non-partisan, fact-finding body "to help mobilize American research talent on a public service basis to produce facts aimed at providing more and better building construction, including housing, for more people at lower cost."

• **PURPOSE.**—Dr. C. F. Rassweiler, vice president in charge of research, Johns-Manville Corp., who served as chairman of the conference, summarized its purpose in the following words:

"The Conference is aimed at giving the different investigators an idea of what others in the building field are doing to solve the problems involved in making building conform more effectively to their climatic surroundings so that duplication can be eliminated and cooperation facilitated."

• **CLIMATE.**—The morning session was devoted to reports on recent climatological research by Dr. Paul Siple, Military Geographer, General Staff, U. S. Army; Dr. Helmut Landsberg, Executive Director, Committee on Geophysics and Geography, Research and Development Board; and Arnold Court, Environmental Protection Section, Quartermaster Corps. These three presentations indicated the wide area in which further study is called for to develop the more precise adaptation of building design to meteorological conditions at the site.

In the afternoon Francis W. Reichelderfer, chief, and H. C. S. Thom, climatological specialist, U. S. Weather Bureau, explored the possibilities of further application of available weather data to the problems of building. The chief obstacle, in their opinion, has been the lack of clear definition of the kind of information required for this purpose, and they suggested further work along this line.

• **MATERIALS.**—Also during the afternoon there were discussions on roofing materials by H. R. Snoke, National Bureau of Standards; on insulation by Professor Frank B. Rowley, director of the Engineering Experiment Station, University of Minnesota; on experimental houses in Austin, Texas, by F. E. Giesecke, formerly of the University of Texas and now a consulting engineer; and on a building test program by Robert F. Legget, director, National Research Council of Canada.

• **COMFORT.**—An evening session January 11 featured talks by Dr. Ralph Linton and James M. Fitch on human factors and structural factors in design for climate control. A round-table discussion panel included William B. Caudill, Robert W. Cutler, Dr. L. P. Herrington, Carl Koch, Alfred B. Parker, Buford L. Pickens.

The conference continued on the morning of January 12 with a paper by Cyril Tasker on the role of weather data on heating and air conditioning and a discussion by John Everetts, Jr., on the influence of climatology upon mechanical systems designed. A panel discussion included comments by L. C. Bastian, Richard S. Dill, G. V. Parmalee, Dr. Harold G. Rose, Robert K. Thulman, William W. Wallace.

ALUMINUM GAS LINE

for underground branch of natural gas network will serve Reynolds plant.

The first aluminum gas line to be installed in the nation will be an all-welded line that will extend underground approximately 1.8 miles from the main trunk line of the Alabama-Tennessee Natural Gas Company to the Listerhill, Alabama, plant of Reynolds Metals Co. The line is being installed by Lehman Hoge & Scott of Sheffield, Alabama, and will be owned by the Alabama-Tennessee Natural Gas Company. Work started December 12.

The line consists of extruded (not drawn) type 63S-T6 aluminum alloy pipe measuring 8⅝ inches outside diameter. Walls will be ¼-inch thick. The line is designed for a working pressure of 200 lb per sq inch, and a bursting pressure of 1,750 lb per sq inch.

Pipe will arrive on the site in 40-ft lengths and be joined by straight butt welds. Ends will be prepared for welding by making a 30-degree bevel at the mill so no end preparation will be necessary on the site. The weld will be made with two passes, using 3/16-

inch diameter 5% silicon type aluminum rod. No flux will be employed since the Heliarc method will be used. This system provides a complete shield of inert gas around the weld zone, protecting the weld and surrounding metal from the action of the atmosphere.

After welding, the entire length of the line including joints will be wrapped by applying cold No-Oxid pipe wrap, made by Dearborn Chemical Co. . . . except a single 40-ft section which will be left unwrapped to determine if wrapping is necessary. This section will be by-passed with another length of pipe which will be wrapped. Valves will disconnect the unwrapped section from the line and allow the gas to flow through the by-pass.

It is planned to dig up the unwrapped section of the line at six-month intervals for examination. Some experimental work already completed has indicated that the wrapping of the aluminum pipe may not be necessary.

HOTTEST TORCH

will cut firebrick or melt tungsten. Works with high frequency radio waves.

Hot enough to cut holes in firebrick and to melt tungsten, hardest to melt of all the elements, an "electronic torch" has been developed by scientists of the General Electric Company's Research Laboratory.

• **RADIO.**—Dr. J. D. Cobine, G-E scientist, combined high-frequency radio signals and various gases to produce temperatures considerably higher than the melting point of tungsten, which is 3,370 degrees Centigrade. He emphasized that the electronic torch is still in the laboratory stage, and that its commercial possibilities have yet to be explored.

Heart of the torch is an electron tube known as a "magnetron," which produces radio waves with the extremely high frequency of one billion cycles per second. Leading from the tube is an antenna made of two short metal cylinders, one within the other. A high-frequency arc can be made to form on the end of the antenna. If certain gases, among them nitrogen and carbon dioxide, are fed past the arc, the electronic torch results, resembling a jet of flame about nine inches long.

• **SPLIT DIPOLES.**—The high temperatures produced on any surface placed in the jet are caused almost entirely by the heat generated as atoms join together to form molecules, Dr. Cobine said. The molecules of the gases are broken up into atoms by the high-frequency arc. These atoms join together again on surfaces placed in the torch. The jet itself is not necessarily hot.

The arc can break up nitrogen molecules, ordinarily composed of two nitrogen atoms, into their separate atoms. When these two atoms strike a surface, they reunite and give off heat, he said. Argon, helium, and other gases that exist normally as single atoms, give a flame essentially devoid of heat, since they cannot be broken and rejoined. An electronic torch composed of one of these gases gives off light, due to motion of the electrons caused by the radio waves, but the hand may be inserted in it without ill effects.

WALL BLOCKS

will carry warm air for radiant heat in new house developed in Switzerland.

A Geneva inventor has produced a building block of new design which he claims will revolutionize the heating of buildings.

• **CLIMABRICK.**—It is called Climabrick. The brick, or block, which may be made of concrete, clay or any plastic material, is penetrated by a double air channel. It is so constructed that when the blocks are placed side by side in the ordinary manner in the wall of a building a double set of continuous canals is formed. One of these canals is filled with an insulator and through the other warm air is forced by a simple blower.

The result, according to the inventor, Angelo Ferraro, is to provide even radiant heat throughhout the entire building, without pipes, ducts or radiators of any kind.

Commenting on an article in *The New York Times* of Nov. 9, 1949, describing heat experiments at the University of Illinois, Mr. Ferraro said, "All the systems so far contemplated to provide radiant heat seem too complicated and too costly." He claims that his brick "is no more expensive to construct than any ordinary brick used in construction."

Construction is to start soon in Italy on two buildings utilizing Climabricks, for which Mr. Ferraro has obtained international patents. Italian designers, he says, are impressed by the fact that from the point of view of eliminating excessive humidity alone, the blocks, which need no insertions or additions of tubing or other conductors, seem to provide a solution.

Swiss manufacturers who have produced the blocks experimentally report that they are no more expensive than ordinary bricks or concrete blocks and that production presents no complications.

PERFORMANCE OF CHIMNEYS

for houses studied by federal bureaus.

Improvement in chimney design and construction in keeping with the improvement in house-heating equipment is greatly needed, it is pointed out in Technical Paper No. 13, "Performance of Masonry Chimneys for Houses," published by the Housing and Home Finance Agency. The paper presents data collected under an investigation of masonry chimney construction, together with conclusions for the improvement of design and construction of such chimneys. The laboratory research forming the basis for paper was performed

as a joint undertaking by the HHFA and the National Bureau of Standards, Department of Commerce.

• **RANGE.**—The scope of this program is intended to include investigation of residential chimneys within three principal ranges of flue gas temperatures: (1) temperatures to which a chimney may be exposed with house-heating equipment operating in the normal manner; (2) temperatures generally above the operating range; and (3) temperatures generally below the middle or operating range.

In the first range, primary interest of the investigation lies in the functional performance of the chimney as a draft-producer. In the second, primary concern is fire hazard, while in the third range the tests are expected to disclose the behavior of the chimney when flue gas temperatures approach or fall below their dew point and condensation occurs within the flue.

• **VARIABLES.**—The scope of the test program also includes corollary investigations of chimney capacity in terms of flue gas volume and velocity, along with the effect of heat capacity of the chimney structures and time lag in "heating up" and "cooling off."

To discover the performance of masonry chimneys from the safety standpoint, a number of chimneys were constructed and tested at the National Bureau of Standards. Construction with respect to clearance and contacts of combustible materials was substantially in accordance with the 1943 National Building Code.

NEWS BRIEFS

• Eight major buildings nearing completion in Manhattan will provide approximately 3,628,000 sq ft of new office space, most of it in the Grand Central area, a survey by the Building Trades Employers' Association revealed. Another building, completed last January, has 170,000 sq ft, making a total of 3,798,000 sq ft of new construction started in the last 17 months. The nine buildings, ranging from 15 stories to 42 stories, are valued at approximately $80,000,000.

• The Bureau of Mines' coal hydrogenation demonstration plant at Louisiana, Mo., has completed a continuous 7-week "break-in" run, converting coal tar oil and Wyoming coal to gasoline and other liquid fuels.

• Twice as much housing is now being built outside city limits as in the mid-twenties, the Housing and Home Finance Agency reports. In 1948 and '49 rural nonfarm housing accounted for about 44% of new residential starts as compared with less than 20% in 1925.

• About 175 cities in 40 states have indicated their intention to participate in the slum clearance and urban redevelopment program authorized by the Housing Act of 1949. About one-third of these cities are in the small city class of 25,000 to 40,000 population.

• Commercial production of anthracite during 1949 approximated 40,410,000 net tons. This is a decline from 1948 of 13,819,000 tons or 25.5%. The severe loss to competitive fuels accounted for a portion of this decline, but the greatest factor was the record-breaking warm weather which prevailed all through 1949.

• The year 1949 was the warmest on record, based upon final degree-day figures for New York City. Every month, with the exception of September, was warmer than normal and September had only three degree days more than normal. Actual degree days in New York City amounted to 4,240 as compared to a normal of 5,279.

• The latest luxury liner to provide selective air conditioning for her passengers is the Ile de France, pampered queen of the French Line fleet, which returned to service last summer after $25 million worth of facelifting and general refurbishing. The temperature regulation system was installed by Johnson Service agents, Etablissements Neu, air conditioning specialists in Paris and Lille, France.

• The largest liner ever to be constructed in the United States, the S.S. United States, will be completely air conditioned, utilizing a very extensive York turbo compressor water cooling system. This will be the biggest air conditioning system ever installed on shipboard, according to an announcement by John R. Hertzler, vice-president and general sales manager of the York Corporation.

• Home-heating oil storage facilities of Esso Standard Oil Company have been increased by 52 million gallons —enough to supply 43,000 homes with an average winter's supply—for the 1949-50 heating oil season. This included the construction of 1,200,000 barrels of additional primary storage facilities, increased storage capacity of a number of smaller bulk plants, and the conversion of storage previously used for other light products.

$7 MILLION HOSPITAL

to be erected by V-A in Chicago medical center.

Veterans Administration has awarded a $6,985,905 contract to the J. L. Simmons Co., Chicago, Illinois, for the construction of a 500-bed general medical and surgical hospital in Chicago.

Also, the Burge Ice Machine Co., Chicago, was awarded a contract for $69,994 to install refrigerating equipment in the new hospital.

The V-A hospital is to be built on a 13-acre site in the medical center district in Chicago's west side.

• **STRUCTURE.**—Construction will include a 4,274,000 cu ft main hospital building, recreation hall, chapel, nurses' and attendants' quarters, boiler house, radial

(Concluded on page 122)

Abstracts AND Reviews

Publications abstracted in this department should be ordered direct from publisher.

HEATING, VENTILATING AND AIR CONDITIONING

The plan of presenting essential fundamentals of heating, ventilating and air conditioning followed in the publication of the first edition of Heating, Ventilating and Air Conditioning Fundamentals, by William H. Severns and Julian R. Fellows, is continued in the second edition recently released.

The new edition has nearly 200 pages of new material covering warm-air furnace heating, hot water heating, panel heating, refrigeration, air purification, estimation of cooling loads and air conditioning. Only a few of the old illustrative problems have been retained and a number of new problems have been added. Included is the design procedure for summer and year-round air conditioning systems.

The authors, both professors of mechanical engineering, University of Illinois, have planned the book to be of value to engineers, heating contractors, architects, as well as students. Along with theory, acceptable commercial practices are given. Representative commercial equipment is described and illustrated.

The text is divided into 20 chapters covering psychrometry, heat transmission and heat losses from buildings, heating with warm air furnaces, heating boilers and appurtenances, piping, steam and hot water heating, panel heating, radiators and convectors, air conveying and distribution, ventilation and air purification, heating with central fan-coil systems and unit heaters, mechanical refrigeration, estimation of cooling loads, apparatus for producing comfort in summer, all-year air conditioning methods and equipment, and automatic controls.

Heating, Ventilating and Air Conditioning Fundamentals, by W. H. Severns and J. R. Fellows. Cloth bound, 6 x 9 inches, 666 pages. Published by John Wiley & Sons, Inc., 440 4th Ave., New York 16, N. Y. Price, $6.50.

PAPE-SWIFT BOILER REFERENCE

Data are presented regarding steam and hot water boilers manufactured from 1890 to and including 1948. It presents complete information on all models, types and sizes, produced or once manufactured by more than 100 boiler manufacturers. It covers domestic boilers up to 2,500 sq ft radiation; commercial boilers from 2,500 to 30,000 sq ft radiation and power boilers from 4 to 300 hp.

The book contains specifications and line drawings of newly designed boilers recently placed on the market, and also line drawings and half-tones to show the mechanical details.

This new edition contains the information presented in the 1933 and 1939 editions, as well as more recent data. An annual supplement will be issued.

Pape-Swift Boiler Reference. Loose leaf binding with a fabricoid cover, 8½ x 11 inches, 1,026 pages. Published by Pape Reference Publications, 4914 Gravois Ave., St. Louis 16, Mo. Price, $12. Supplements for 3 years, $6.

• • •

OPERATION OF HOME HEATING SYSTEMS — A large instruction sheet, 17 x 22 inches, has been prepared to be placed near the boiler at the time of installation to provide tabulated yet simple instructions for the proper operation of hot water and steam heating plants. Detailed suggestions are given in the operation and care of both manually and automatically fired hot water and steam heating systems. Included in this chart is the I-B-R chimney check chart for commonly encountered defects that may cause insufficient chimney draft. The sheet also has detailed information on hand firing. Institute of Boiler and Radiator Manufacturers, 60 E. 42nd St., New York 17, N. Y. Price, $4 per 100 copies.

STEEL HEATING BOILERS—Copies of Simplified Practice Recommendation R157-50, covering both commercial and residential types of steel firebox boilers and steel heating boilers, is now available. This new release enlarges the scope of the original recommendations published in 1937 to include the simplified and uniform list of ratings for residential steel boilers, oil-fired, in terms of steam and water radiation and Btu per hour. Minimum furnace volume and minimum heating surface are included for these boilers. Price, ten cents, Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

SYNTHETIC RUBBER PACKINGS—The hydraulic engineering staff of E. F. Houghton & Co., Philadelphia, has made revisions for the handbook on Synthetic Rubber Packings which is now in its third edition. Completely brought up to date, this edition, the third within three years, has information on packing standardization advocated by the company and by the Joint Industry Conference. This cloth-bound book of 110 pages has information available on application and design for the use of synthetic rubber packings. E. F. Houghton & Company, 303 West Lehigh Avenue, Philadelphia 33, Pa.

BOILERS AND TANKS—A revision of simplified practice recommendation R8-47 on ferrous range boilers, expansion tanks and solar tanks has been submitted to the industry for acceptance or comment. The recommendation, originally issued in 1923, is a simplified schedule of sizes, capacities and working pressures for range boilers, expansion tanks, and solar tanks made of ferrous metal. Commodity Standards Division, National Bureau of Standards, Washington 25, D. C.

DEGREE-DAYS FOR DECEMBER, 1949

(A) Airport readings (O) City office readings; (O) Readings at a point on outskirts of city.

HEATING AND VENTILATING'S 22nd Year of Publication of Monthly Degree-Day Data

City	December			Cumulative, September 1 to December 31			Heating Season[1]
	1949	1948	Normal	1948-49	1947-48	Normal	Normal
Abilene, Texas (A)	513	462	592	870	950	925	2061
Albany, New York (A)	1098	1111	1147	2486	2354	2439	6580
Albuquerque, New Mexico (A)	958	836	924	1680	1893	1827	4298
Alpena, Michigan (C)	1142	1142	1247	2729	2522	2951	8299*
Anaconda, Montana (C)	1302	1467	1238	3143	3466	3171	8357**
Asheville, North Carolina (C)	677	710	837	1531	1509	1689	4232
Atlanta, Georgia (C)	600	532	639	1079	1006	1131	2890
Atlantic City, New Jersey (C)	756	753	893	1432	1436	1735	5176
Augusta, Georgia (A)	446	415	549	780	712	886	2161
Baker, Oregon (C)	1122	1394	1156	2632	3159	2815	7163
Baltimore, Maryland (C)	728	751	874	1361	1407	1664	4533
Billings, Montana (A)	1315	1385	1194	2760	2817	2816	7119
Binghamton, New York (C)	1021	1068	1156	2314	2244	2515	6808
Birmingham, Alabama (A)	548	503	595	1042	982	913	2352
Bismarck, North Dakota (A)	1711	1667	1553	3405	3358	3514	9192
Block Island, Rhode Island (C)	798	801	884	1628	1608	1736	5788
Boise, Idaho (A)	1051	1226	1011	2330	2614	2285	5552
Boston, Massachusetts (A)	872	892	1026	1851	1770	2130	6045
Boseman, Montana (C)	1261	1468	1293	3049	3328	3286	8521**
Buffalo, New York (A)	983	1012	1104	2273	2219	2372	6822
Burlington, Iowa (A)	1041	1104	(a)	2166	2275	(a)	(a)
Burlington, Vermont (A)	1139	1126	1287	2664	2487	2773	7514
Butte, Montana (C)	1366	1591	1261	3276	3695	3183	8235**
Cairo, Illinois (C)	663	674	822	1317	1335	1499	3909
Canton, New York (C)	1185	1145	1342	2815	2539	2994	8020
Charleston, South Carolina (C)	349	297	425	585	470	632	1769
Charlotte, North Carolina (C)	613	551	679	1130	1033	1220	3120
Chattanooga, Tennessee (A)	673	636	694	1259	1264	1225	3118
Cheyenne, Wyoming (A)	1160	1199	1144	2639	2938	2889	7466
Chicago, Illinois (C)	962	1004	1074	1982	1968	2172	6077
Cincinnati, Ohio (C)	743	783	927	1511	1577	1796	4684
Cleveland, Ohio (A)	956	970	1060	2075	2050	2185	6155
Columbia, Missouri (C)	839	880	985	1690	1766	1896	4922
Columbia, South Carolina (C)	492	437	561	876	763	916	2364
Columbus, Ohio (C)	867	885	1017	1820	1820	2020	5398
Concord, New Hampshire (A)	1147	1119	1234	2706	2529	2732	7353
Concordia, Kansas (C)	1024	1030	1050	1847	2062	2019	5315
Dallas, Texas (A)	459	447	567	774	832	870	2256
Davenport, Iowa (C)	1033	1082	1175	2211	2170	2333	6289
Dayton, Ohio (A)	926	964	1014	2035	2044	1947	5264
Deer Lodge, Montana (C)	1325	1586	1331	3241	3657	3518	8672**
Denver, Colorado (C)	923	1011	1017	1875	2213	2276	5874
Des Moines, Iowa (C)	1118	1138	1215	2173	2248	2370	6384
Detroit, Michigan (A)	993	1032	1113	2227	2148	2332	6490
Devils Lake, North Dakota (C)	1855	1777	1710	3788	3615	3871	9970
Dodge City, Kansas (A)	956	988	1004	1746	2036	1952	5035
Dubuque, Iowa (C)	1150	1178	1243	2373	2393	2534	6790
Duluth, Minnesota (C)	1566	1495	1519	3411	3127	3489	9483
Eastport, Maine (C)	1038	1060	1228	2537	2533	2890	8520**
Elkins, West Virginia (A)	892	925	1035	2142	2169	2217	5697
El Paso, Texas (A)	653	533	617	1069	1149	1038	2428
Ely, Nevada (A)	1291	1429	(a)	2858	3340	(a)	(a)
Erie, Pennsylvania (C)	900	925	1039	1971	1902	2164	6273
Escanaba, Michigan (C)	1244	1247	1344	2920	2725	3138	8771
Evansville, Indiana (A)	764	777	862	1618	1643	1545	4244
Fort Smith, Arkansas (A)	658	653	707	1240	1267	1177	3147
Fort Wayne, Indiana (A)	983	1056	1138	2206	2222	2211	5925
Fort Worth, Texas (A)	472	435	574	806	796	826	2148
Fresno, California (A)	645	637	577	1024	1083	911	2334
Galveston, Texas (C)	190	157	270	271	285	330	1016
Grand Junction, Colorado (A)	1101	1134	1162	2185	2462	2278	5548
Grand Rapids, Michigan (C)	994	1058	1147	2220	2181	2397	6535
Green Bay, Wisconsin (C)	1279	1271	1324	2923	2678	2882	7825
Greensboro, North Carolina (A)	725	686	760	1432	1395	1395	3529
Greenville, South Carolina (A)	643	583	738	1223	1114	1334	3380
H rrisbu.rg, Pennsylvania (A)	913	951	992	1880	1908	1981	5375
Hartford, Connecticut (A)	1020	1019	1060	2137	2070	2157	6036
Hatteras, North Carolina (C)	401	404	493	688	614	727	2571
Havre, Montana (C)	1678	1690	1383	3239	3329	3314	8700
Helena, Montana (A)	1395	1619	1245	3241	3459	3058	7894**
Houston, Texas (C)	239	214	335	358	389	449	1157
Huron, South Dakota (A)	1410	1425	1431	2861	2957	3085	8004
Indianapolis, Indiana (A)	903	947	1017	1961	2036	2002	5298
Jackson, Mississippi (A)	410	405	(a)	754	748	(a)	(a)
Kansas City, Missouri (A)	866	907	1008	1599	1721	1866	4956
Knoxville, Tennessee (A)	680	701	781	1355	1357	1483	3670
La Crosse, Wisconsin (A)	1344	1364	1311	2818	2759	2778	7322
Lander, Wyoming (A)	1377	1446	1419	3039	3237	3075	7947

(a) Data not available.

[1]Figures in this column are normal totals for a complete heating season, September to June, incl.

Figures in this table, with seven exceptions, based on local weather bureau reports. Exceptions are Utica and Lewiston, figures for which are furnished through the courtesy of Coke Sales Department, Central New York Power Corp., Utica, N. Y., and Norman E. Ross, Bursar, Bates College, Lewiston, Me., respectively; Anaconda, Bozeman, Butte, Deer Lodge and Livingston, Mont., through the courtesy of the Montana Power Company.

[Table concluded on page 114]

Degree-Days for December, 1949 (Concluded)

(A) Airport readings (C) City office readings; (O) Readings at a point on outskirts of city.

HEATING AND VENTILATING's 22nd Year of Publication of Monthly Degree-Day Data

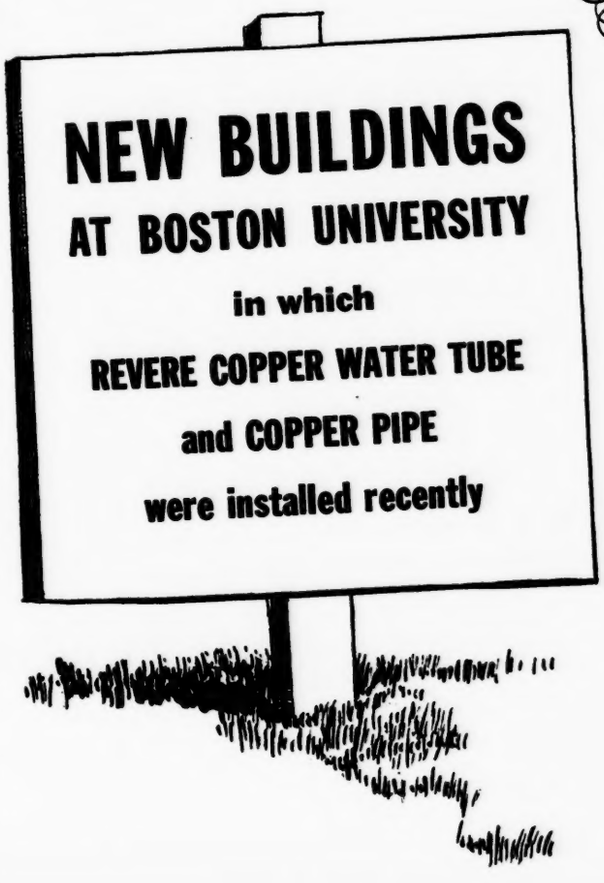
City	December			Cumulative, September 1 to December 31			Heating Season[1]
	1949	1948	Normal	1948-49	1947-48	Normal	Normal
Lansing, Michigan (A)	1052	1121	1209	2505	2372	2665	7048
Lewiston, Maine (O)	1107	1082	1295	2585	2379	2837	7707
Lincoln, Nebraska (C)	1076	1152	1132	2012	2283	2201	5999
Little Rock, Arkansas (A)	594	599	651	1074	1137	1079	2811
Livingston, Montana (C)	1169	1294	1117	2648	2870	2731	7245**
Los Angeles, California (C)	294	367	301	414	510	424	1504
Louisville, Kentucky (A)	729	775	849	1532	1588	1587	4180
Lynchburg, Virginia (A)	753	745	800	1503	1539	1557	3980
Macon, Georgia (A)	466	424	324	829	796	897	2201
Madison, Wisconsin (C)	1202	1226	1321	2546	2502	2758	7429
Marquette, Michigan (C)	1268	1260	1302	2950	2777	3054	8693*
Memphis, Tennessee (A)	581	598	663	1146	1167	1127	2950
Meridian, Mississippi (C)	462	407	549	875	789	883	2160
Milwaukee, Wisconsin (A)	1126	1147	1221	2487	2384	2601	7245
Minneapolis, Minnesota (A)	1384	1396	1404	2807	2779	2941	7850
Montgomery, Alabama (C)	418	356	496	722	640	769	1884
Nantucket, Massachusetts (A)	825	839	905	1811	1809	1912	5957
Nashville, Tennessee (A)	670	657	744	1342	1328	1363	3507
New Haven, Connecticut (A)	933	965	1017	1954	1898	2109	5895
New Orleans, Louisiana (C)	223	193	301	368	416	403	1024
New York, N. Y. (C)	767	816	940	1495	1505	1856	5274***
Nome, Alaska† (A)	1228	1796	1509	2769	3842	3379	14580**
Norfolk, Virginia (C)	545	551	685	963	953	1195	3350
North Head, Washington (C)	682	772	510	1690	1965	1785	5452**
North Platte, Nebraska (A)	1124	1167	1173	2331	2493	2486	6366
Oakland, California (A)	569	617	496	1074	1233	1099	3143**
Oklahoma City, Oklahoma (C)	705	660	815	1219	1270	1379	3613
Omaha, Nebraska (A)	1088	1161	1175	2096	2291	2284	6131
Oswego, New York (C)	1020	1017	1138	2283	2163	2494	7088
Parkersburg, W. Virginia (C)	807	833	921	1700	1747	1830	4775
Peoria, Illinois (A)	984	1040	1150	2100	2141	2323	6109
Philadelphia, Pennsylvania (C)	753	800	884	1458	1465	1699	4737***
Phoenix, Arizona (C)	386	407	425	465	663	581	1405
Pittsburgh, Pennsylvania (C)	841	859	967	1774	1779	1949	5235
Pocatello, Idaho (A)	1180	1329	1181	2684	2947	2649	6655
Portland, Maine (A)	1081	1090	1159	2601	2452	2605	7218
Portland, Oregon (C)	694	795	729	1554	1816	1724	4469
Providence, Rhode Island (C)	867	884	1026	1842	1761	2130	6015
Pueblo, Colorado (A)	992	1015	1029	1983	2279	2164	5514
Raleigh, North Carolina (C)	580	568	694	1067	1055	1253	3234
Rapid City, South Dakota (A)	1331	1300	1172	2638	2750	2701	7118
Reading, Pennsylvania (C)	836	899	1001	1717	1718	2014	5389
Red Bluff, California (A)	639	711	(a)	962	1154	(a)	(a)
Reno, Nevada (A)	1037	1175	973	2329	2582	2284	5892
Richmond, Virginia (C)	660	662	763	1234	1256	1380	3695
Rochester, New York (A)	1026	1053	1125	2572	2225	2414	6732
Roseburg, Oregon (C)	724	820	719	1615	1868	1741	4428
Roswell, New Mexico (A)	807	651	808	1450	1506	1510	3484
Sacramento, California (C)	628	678	574	1001	1142	996	2653
St. Joseph, Missouri (A)	1000	1014	1079	1880	1981	1960	5161
St. Louis, Missouri (C)	741	815	936	1466	1573	1738	4585
Salt Lake City, Utah (A)	1077	1232	1020	2279	2589	2149	5555
San Antonio, Texas (A)	296	307	347	441	580	473	1202
San Diego, California (A)	313	353	288	454	561	487	1645
Sandusky, Ohio (C)	919	953	1063	1913	1979	2142	6208
San Francisco, California (C)	448	534	428	933	1102	949	3264**
Sault Ste. Marie, Michigan (A)	1329	1301	1370	3241	2943	3247	9285**
Savannah, Georgia (A)	326	279	397	587	445	598	1490
Scranton, Pennsylvania (C)	976	1012	1085	2141	2065	2274	6129
Seattle, Washington (C)	722	808	719	1672	1980	1869	4934**
Sheridan, Wyoming (A)	1339	1376	1320	2853	2983	3198	8008
Shreveport, Louisana (A)	428	425	499	759	797	769	1938
Sioux City, Iowa (A)	1221	1359	1265	2438	2699	2583	6898
Spokane, Washington (A)	1155	1345	1057	2667	3041	2583	6355
Springfield, Illinois (C)	864	932	1039	1748	1825	2002	5373
Springfield, Missouri (A)	806	836	893	1674	1707	1674	4428
Syracuse, New York (A)	1038	1047	1172	2324	2233	2491	6893
Tacoma, Washington (C)	767	847	756	1821	2149	1951	5181**
Terre Haute, Indiana (A)	877	919	992	1897	1945	1840	4872
Toledo, Ohio (A)	987	1031	1079	2208	2208	2189	6077
Topeka, Kansas (C)	929	923	1008	1694	1764	1883	4969
Trenton, New Jersey (C)	824	866	930	1697	1652	1760	4933
Utica, New York (O)	1125	1051	1144	2349	2101	2537	6796
Valentine, Nebraska (C)	1235	1282	1245	2571	2749	2725	7039
Walla Walla, Washington (C)	816	1028	896	1841	2187	1909	4808
Washington, D. C. (C)	718	758	896	1391	1457	1741	4626
Wichita, Kansas (A)	861	871	955	1564	1705	1783	4673
Williston, North Dakota (C)	1750	1719	1591	3537	3418	3658	9323
Winnemucca, Nevada (C)	1142	1198	1080	2537	2694	2589	6427**
Yakima, Washington (A)	973	1272	1091	2288	2754	2428	5599

(a) Data not available.
†Nome data are for November.

*Includes August.
**Includes July and August.
***New 48-year normal covering 1898 to 1946.

[1]Figures in this column are normal totals for a complete heating season, September to June, incl.

Cram and Ferguson, Architects-Engineers;
C. H. Cronin, Inc., Plumbing Contractor.



MORE than 10,000 feet of Revere Copper Water Tube, in sizes from 3/8" to 4", and a similar amount of Revere Copper Pipe, from 1/2" to 4", were installed recently in four new buildings at Boston University.

Revere particularly welcomes the opportunity to supply materials for buildings where long life and low maintenance cost are of first importance. For such installations take full advantage of the long-lasting qualities of copper.

Because copper is non-rusting it costs less in the long run . . . and architects, engineers and contractors are finding that Copper Water Tube provides many economies during installation.

All Revere Copper Water Tube is stamped at regular intervals with the Revere name and the type. These marks are more than identification—they are your assurance of full wall thickness and the close dimensional tolerances so essential for tight soldered joints.

It will also pay you to install such other long-lived Revere materials as Red-Brass Pipe; Sheet Copper and Herculoy for tanks, ducts, pans and trays; Dryseal Copper Refrigeration Tube (dehydrated and sealed); Copper oil burner, heat control and capillary tubes.

Revere materials are handled by Revere Distributors in all parts of the country. The Revere Technical Advisory Service is always ready to serve you. Call your Revere Distributor.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, New York

• • •

Mills: Baltimore, Md.; Chicago, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.—Sales Offices in Principal Cities, Distributors Everywhere.

NEW CATALOGS

Diffuser Selection Manual

A 64-page, 2-color manual offers a simplified step-by-step procedure for selection of proper air diffusers for various applications. Methods of volume control, air flow directional control, directions for installation, typical and special applications, illustrations of various models with rating tables and accessories, prices and shipping weights are included.—*Anemostat Corporation of America, 10 East 39th St., New York 16, N. Y.*

Item 17

Air Conditioning Equipment and Service

Some of the refrigerating, ice-making and air conditioning equipment and services available from Frick Company are described and illustrated in an 8-page, 2-color bulletin, No. 195-A. — *Frick Company, Inc., Waynesboro, Pa.*

Item 18

Commercial Gas Burner Operation Data

Performance data on Iron Fireman commercial gas burners are included in a portfolio of testimonial letters and experience reports.—*Iron Fireman Manufacturing Co., 3170 West 106th St., Cleveland 11, Ohio.*

Item 19

Fire Protection Equipment

Architects' Catalog 148, 32 pages, 3 colors, presents the Allen line of equipment for interior fire protection, including fire hose, portable extinguishers, enclosures, racks, valves, standpipe outlets, etc.—*W. D. Allen Manufacturing Co., 566 West Lake St., Chicago 6, Ill.*

Item 20

Steam Generating Equipment

A portfolio of catalogs covers steam condensers, steam jet air ejectors, oil and water coolers, packaged power boilers, centrifugal and piston pumps. — *Condenser Service & Engineering Co., Inc., Hoboken, N. J.*

Item 21

Refrigeration Engineering Data

Kramer engineering data and design procedure covering refrigeration load calculations at temperatures above and below 32F are offered in catalog No. R-114A. Heat gain and loss data, storage temperatures and other useful tables are included. — *Kramer-Trenton Company, Trenton 5, N. J.*

Item 22

Controlled Humidity Air Conditioning

Bulletin 112 describes the Niagara blower controlled humidity method of air conditioning.—*Niagara Blower Co., 405 Lexington Ave., New York 17, N. Y.*

Item 23

Prefab Central Station Air Conditioners

A new line of prefabricated central station air conditioners designed for quality, ruggedness, efficiency, and rapid installation is described and illustrated in a 12-page, 2-color bulletin. Conditioners are furnished in factory assembled and insulated sections ready for installation. Tables of specifications show capacities from 7,430 to 20,250 cfm and from 22 to 59 tons refrigeration. — *Buensod-Stacey, Inc., 60 E. 42nd St., New York 17, N. Y.*

Item 24

Resistance-Heated Rubber

A new information bulletin on embedded wire resister type of electrically heated rubber contains information on electrically heated rubber, which is described as a thin, flexible surface or space heater. It is made up of a resistance wire heating ply sandwiched between plies of specially compounded synthetic rubber. It can be made in any size or shape for any use. It operates on any voltage either a-c or d-c. Bulletin is set up as questions and answers regarding the nature, performance and physical characteristics of electrically heated rubber.—*The B. F. Goodrich Co., Akron, Ohio.*

Item 25

Liquid Level Instruments

A 24-page illustrated catalog, No. 75, describes Levelimeter instruments which indicate, measure and control liquid level and inter-face level. Illustrated and described are magnetic tape-and-drum, electronically transmitting, ball-float, pneumatic and differential pressure units; V-notch weir and Parshall flume flowmeter instruments; and chemical service sight gage glasses.—*Fischer & Porter Company, 75 County Line Road, Hatboro, Pa.*

Item 26

Refrigeration Controls

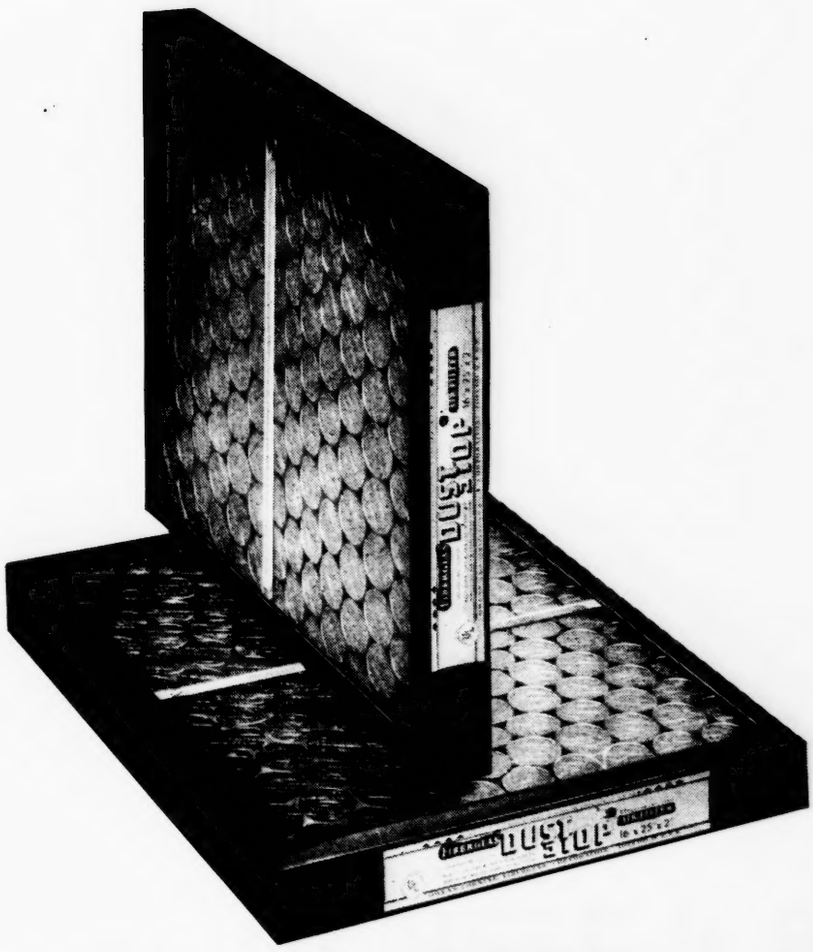
Bulletin 1248, 32 pages, describes and illustrates various makes of replacement parts for domestic and commercial refrigeration. Items include temperature controls for all applications and replacements are listed by brand name, year and model. Catalog is punched for looseleaf insertion.—*Ranco Inc., 601 West Fifth Ave., Columbus 1, Ohio.*

Item 27

Air Conditioning Units

A 2-color, 12-page catalog, Bulletin 409, covers the complete line of Marlo air conditioning units with illustrations and factual, simplified descriptions of design basis and operation. Dimensional data, capacities and ratings are included.—*Marlo Coil Co., 6135 Manchester Ave., St. Louis 10, Mo.*

Item 28



now, even the BEST is BETTER

Two great new features of the original, genuine DUST-STOP* Air Filter now put this leader even farther ahead of the field

1 **DUST-STOP Air Filters** now have *one-third longer life* with the same high efficiency as before—thanks to a new adhesive that spreads the dust more evenly throughout the entire depth of the filter.

2 **DUST-STOP Air Filters** are now listed by Underwriters' Laboratories, Inc. So look for the famous U. L. marker on DUST-STOPS. It means a definite contribution to fire-safety, and in some states even brings lower insurance rates.

For full details, contact your DUST-STOP Distributor, or write to Owens-Corning Fiberglas Corp., Dept. 41-B, *Toledo 1, Ohio.*

FIBERGLAS* IS IN YOUR LIFE...FOR GOOD!

DUST STOP* AIR FILTERS . . . a OWENS-CORNING FIBERGLAS product

*T.M. REG. U. S. PAT. OFF.

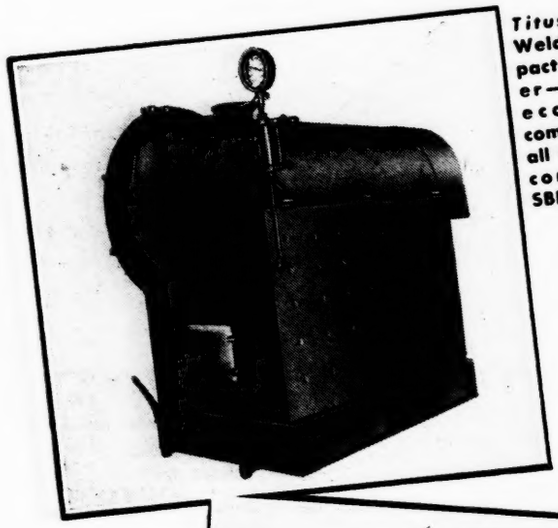
FIBERGLAS is the trade-mark (Reg. U. S. Pat. Off.) of Owens-Corning Fiberglas Corporation for a variety of products made of or with glass fibers. DUST-STOP is the trade-mark of Owens-Corning Fiberglas Corporation for impingement type air filters made of glass fibers.

TITUSVILLE Builds

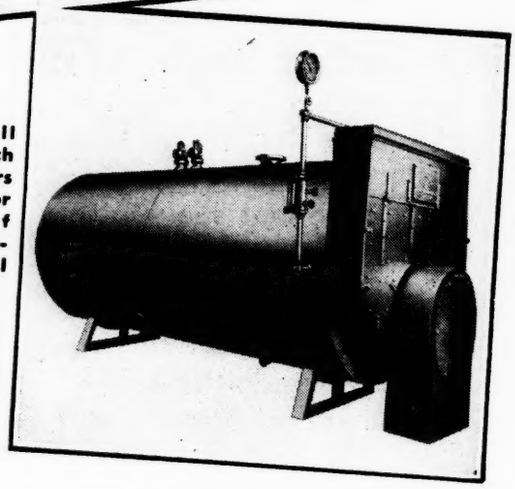
A COMPLETE LINE OF DEPENDABLE, ALL WELDED

HEATING BOILERS

IN SIZES AND RATINGS TO FIT EVERY REQUIREMENT



Titusville All Welded, Compact Steel Boiler—provides economical combustion for all fuels. ASME constructed, SBI rated.



Titusville All Welded Scotch Heating Boilers—available for all types of fuel. ASME constructed, SBI rated.

Since 1860 TITUSVILLE BOILERS have been the accepted standard of quality, dependability and economy. Get the TITUSVILLE facts before purchasing any new or replacement boiler.

Write today for new technical, informative bulletins

The TITUSVILLE IRON WORKS Co.

DIVISION OF STRUTHERS WELLS CORPORATION

TITUSVILLE, PENNSYLVANIA

Automatic Valve Specialties

The Davis automatic pressure, flow and liquid level controls for steam, air, gas, water, oil, and other fluids are described in condensed catalog A-50, 80 pages, consisting of a series of separately bound bulletins covering various valve specialties and including a section of technical data and capacity charts. Sectional drawings and price lists are included.—*Davis Regulator Co., 2541 S. Washtenaw Ave., Chicago, Ill.*

Item 29

Insulation Guide

Recommended insulation products for custom built jobs in subzero to temperatures of 1900F are offered in an 18-page, thumb indexed brochure. Products include air cell insulations, asbestos products, insulating blocks, Watcocell pipe coverings, etc. A section of technical data includes information on heat transmission and conductivity of various products.—*The Ruberoid Co., 500 Fifth Ave., New York 18, N. Y.*

Item 30

Corrosion-Resisting Fans

A 12-page bulletin, No. 1103, describes Durco corrosion-resisting fans with general information regarding alloys, standard construction and applications and specific dimensional and capacity information regarding fan models handling from 150 to 7,500 cfm. A section on accessories covers hood outlets, adapters and condensate traps.—*The Duriron Co., Inc., Dayton 1, Ohio.*

Item 31

Rubber-Lined Pipe and Fittings

An 8-page catalog section, No. 9780, on rubber-lined pipe fittings gives design, construction and service recommendations, lists many uses and pictures and describes the products. These include, besides rubber-lined pipe, gaskets for flanged pipe assembly, expansion joints, Flexseal connectors to reduce vibration in lines, Vulcalock valves, rubber-lined and relinable valves. Specifications and data are listed.—*The B. F. Goodrich Co., Akron, Ohio.*

Item 32

FEBRUARY, 1950

TO OBTAIN COPIES OF TRADE LITERATURE listed in this issue, circle on the list below the publication wanted, using item number at the end of each review. Print your name and address, mail to

Editor, HEATING AND VENTILATING,
148 Lafayette Street, New York 13, N. Y.

17	18	19	20	21	22	23	24
25	26	27	28	29	30	31	32

Name.....

Title (Must be shown).....

Firm (Must be shown).....

Business Address.....

City.....Zone....State.....2/50

LEE DIRECT WARM AIR HEATING

Higher Efficiency! Greater Economy!

Direct warm air heating is fundamentally the most efficient means of transferring heat from fuel to air, and is especially suited to the heating of industrial buildings of all types, hangars, etc. Lee Engineering Company was one of the pioneers in this field, and today offers a complete line of both central system heaters and unit heaters. The Lee system gives heat WHEN needed and WHERE needed. It begins to distribute heat immediately after fire is lighted and fan started, responds promptly without lag. Air-flow is counter-current to flow of combustion gases, so that air becomes warmer as it extracts heat from the progressively hotter gases. Lower installation cost than steam or hot water; requires no licensed attendant; provides ventilation without additional cost. No expensive installation or maintenance of pipes, traps, valves, and pumps. Used with oil or gas, also with coal (stoker or hand-fired). Four main types illustrated here—send for Bulletin 10 with complete facts.

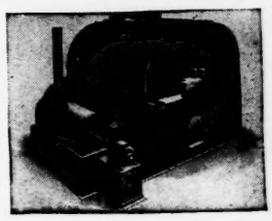
BRICK-SET TUBULAR HEATER

For use with central heating system (with duct distribution). Single heater capacities, 2,800,000 to 8,000,000 Btu per hour. Battery of two, operating as unit, provide over 10,000,000 Btu per hour.

Brick Set Tubular Heater

STEEL ENCASED TUBULAR HEATER

For use with central heating system (with duct distribution). Capacity range, 2,000,000 to 6,000,000 Btu per hour. May be installed in heated area without enclosure, requires no foundation. Unit may be moved by taking apart and reassembling.



Steel Encased Tubular Heater

TUBULAR UNIT HEATER

For use as central system (with duct distribution) or as unit heater, with adjustable outlet nozzles. Capacity range, 2,000,000 to 6,000,000 Btu per hour. In sizes up to 4,000,000 Btu, shipped completely assembled with all but mechanical equipment, refractory lining and controls in place. Requires no foundation. Equipped with crane hooks for moving.

Tubular Unit Heater

SHELL UNIT HEATER

For use with or without distributing duct system. Capacity range, 300,000 to 2,000,000 Btu per hour. Both hand- and stoker-fired models. All units shipped completely assembled, wired, ready for operation. Units furnished with either refractory lined or stainless steel combustion chambers. Heaters may be floor mounted or suspended in any position.

Shell Unit Heater

LEE ENGINEERING COMPANY

95 RIVER STREET • HOBOKEN, NEW JERSEY

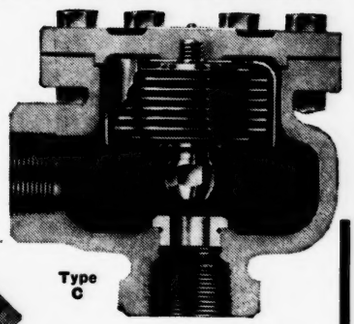
(Formerly Youngstown, Ohio)

Leading Processor

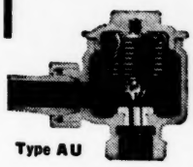
Shortens Operation from 65 to 45 Min.

with Nicholson STEAM TRAPS

Records of a recent installation of Nicholson steam traps, by a large food packer, show they cut cooking time 30%;



Type C



Type AU

Type AHV

e.g., one operation was shortened from 65 to 45 min. Nicholson units keep equipment full of live steam because: 1) they operate on lowest temperature differential; 2) have 2 to 6 times average drainage capacity. Also record low for steam waste; and maximum air-venting capacity. Widely specified for preventing damage to thin gauges of heat transfer units; eliminate cold blow in unit heaters. 5 types for every application; size ¼" to 2"; pressure to 225 pounds.

BULLETIN 1047.

W. H. NICHOLSON & CO. 199 OREGON ST. WILKES-BARRE, PA.

Valves ★ Traps ★ Steam Specialties

FLOWLINE *Stainless* **STEEL**

Trade Mark

WELDING FITTINGS

For all Corrosion-Resisting Applications

Smooth, uninterrupted flow is assured in any piping system using *FLOWLINE* stainless steel welding fittings because:

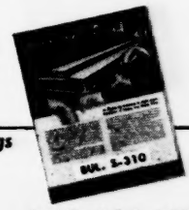
(1) The interior walls of each fitting are free from scores, scratches, die marks, waves, or ridges.

(2) All elbows are "long radius"—1½ times nominal pipe size.

(3) All fittings perfectly match corresponding tubing and pipe sizes in circularity and in wall thickness.

(4) The ends are accurately machine tool cut—fittings of wall thickness over .083" are beveled to 37½° with approximately 1/16" straight face; those with wall thickness of .083" or lighter are cut straight, not beveled.

FLOWLINE fittings are available in Stainless Types 304, 316, and 347—to match pipe and tubing of various wall thicknesses in sizes from ¾" through 12".



The Most Complete Line of Stainless Steel Welding Fittings

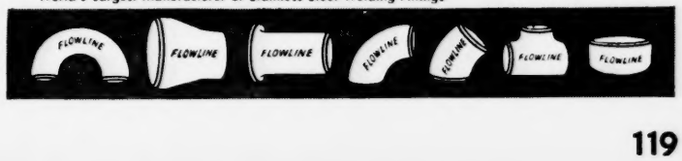
WELDING FITTINGS CORP.

NEW CASTLE, PENNSYLVANIA

Formerly Stainless Alloy Division - Pittsburgh Piping and Equipment Co.

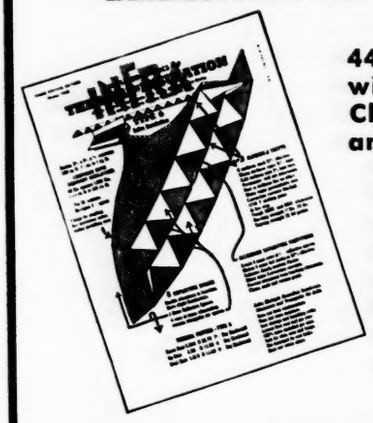
World's Largest Manufacturer of Stainless Steel Welding Fittings

Send for Bulletin S-310



The New Edition is Ready!

"Simplified Physics of THERMAL INSULATION"



44 Pages Crammed with Facts, Figures, Charts, Illustrations, and Explanations of Heat and Vapor Transfer; Conduction and Density; Convection; Radiation and Emissivity; Rejection, Reflection, Absorption; and Permeability.

WINTER, 1949 EDITION

SENT ABSOLUTELY FREE!

Simply, clearly and precisely written in down-to-earth language. A handy reference manual on insulation for Architect, Engineer, Builder, Contractor, Heating Installer. Previous editions used by dozens of technical schools and colleges as a text on insulation. Topics include Vapor, Vapor Barriers, Humidity, Condensation, Radiant Heating. Discusses every kind of material, mass fibrous insulations and reflective types, compares them, tells where and how to use them.

WORTH GETTING JUST FOR THE

CHART OF THERMAL INSULATION VALUES

Latest, specially compiled data on *k*, C, R, and U factors of all insulations, of all thicknesses, and their densities, weights, cubic contents. Complete list of sources.

SEND THE COUPON FOR YOUR COPY

ACCORDION MULTIPLE ALUMINUM & TRIANGULAR REFLECTIVE AIR CELLS

Infra INSULATION, INC.
10 Murray St., N. Y., N.Y.

Please send me "Simplified Physics of Thermal Insulation." V-2

Name_____

Connection_____

Address_____

_____

What Happened at Dallas

(Concluded from page 92)

rooms and experienced instantaneous thermal impressions. On the other hand, for equilibrium conditions, the present ET index places too much emphasis on the influence of relative humidity.

Removal of Internal Radiation

Research conducted by Merl Baker, assistant professor of mechanical engineering, University of Kentucky, indicates that a maximum of 65% of the electrical input to a large incandescent filament may be removed directly from the conditioned space by cooling panels. Results of his studies are presented in a paper on "Removal of Internal Radiation by Cooling Panels." A number of interesting findings were reported.

For example, he learned that a room with one-half the surface area exposed to the outside generally possesses enclosure surfaces at temperatures low enough to absorb and remove about 50% of the total lighting load.

The per cent of the filament input that is ineffective in heating the air is independent of the type of reflectors used, although the shape factor range considered varied from 0.406 to 0.827.

As the size of the bulb decreases, the rate of heat removal apparently decreases.

The author points out that the favorable comparison between the calculated and measured panel absorption tends to verify the hypothesis that multiple reflection must be considered when dealing with high temperature energy sources.

Night-Air Cooling

In a paper on "Night-Air Cooling," by F. E. Giesecke, consulting engineer, New Braunfels, Tex., a bank building is used as an example to show that night-air cooling can be applied economically to commercial and industrial buildings as well as to residences.

The First National Bank Building, New Braunfels, Tex., a building of 40,500 cu ft and 7,600 sq ft of surface area, was equipped with a 15 hp air conditioning system. This system was operated from 7 a.m. to 5 p.m. and the night-air cooling system, based on exhausting warm air from the building, from 9:30 p.m. to about 6 a.m.

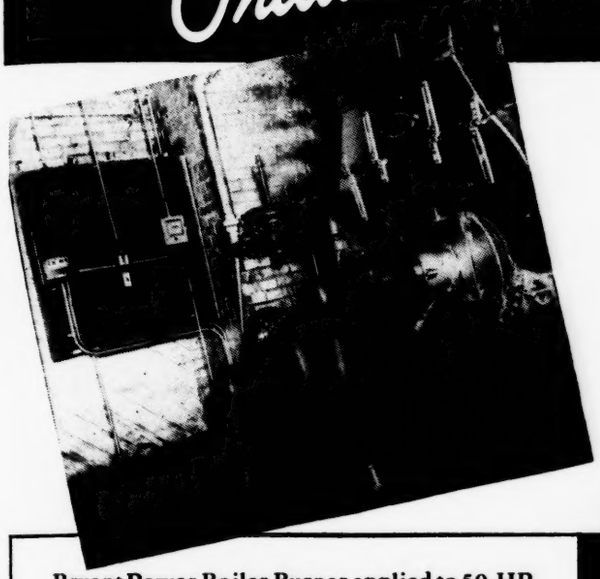
The forced warm air heating system of the bank has a centrifugal fan belted to a 5 hp, 220-volt motor operating at 1,800 rpm to deliver 9,000 cfm with the fan operating at 648 rpm.

According to the data presented, the cost of mechanical refrigeration in small units is about 1 kw per ton, while the cost of night-air cooling should be less than one-half the cost of mechanical refrigeration.

Night-air cooling evidently cannot be used in localities where the outdoor air contains dust or other objectionable materials in such amounts that it would be detrimental to pass large quantities of air throughout the building.

Bryant Industrial

Hi-Flo BLOWERS



CONSTANT AIR PRESSURE FOR EFFECTIVE COMBUSTION

- Where constant air pressure is a *must,* use Bryant *Hi-Flo* Blowers. They maintain *constant* air pressure throughout their entire range of capacity, using *one burner or many.*

Hi-Flo Blowers feature lightweight aluminum construction and *smooth* operation. Supplied in 4-ounce, 10 to 12-ounce and 16 to 18-ounce pressure ranges. Write for Data Sheet 6A-4 for complete information and specifications.

Bryant Power Boiler Burner applied to 50-HP Scotch Marine Boiler to develop 100 HP. Important feature of assembly is *Hi-Flo* Blower which assures constant pressure and pulsation-free air at all times. Note well-engineered compactness of assembly, typical of Bryant Industrial Combustion Equipment.

BRYANT INDUSTRIAL DIVISION
Affiliated Gas Equipment, Inc.
1020 LONDON ROAD • CLEVELAND 10, OHIO

GAS HEATING EXPERTS SELECT . . .

HYDROTHERM

FOR RADIANT & CONVECTOR SYSTEMS.

MODEL 2HW3
Capacity: 72,000 BTU Input
Size: 13"x26"x26"
Weight: 250 lbs.

Exclusive Cast-Iron Design Assures Maximum Performance at Lowest Cost in Minimum Space

AGA Approved for All Gases
100 lbs. A.S.M.E. Rating

Write For HYDRO THERM Bulletin HV
Immediate Delivery

HOOK & ACKERMAN, Inc.
18 East 41st Street, New York 17, N. Y.

Another New York City Housing Project — the General C. W. Berry Houses (shown below) — installed

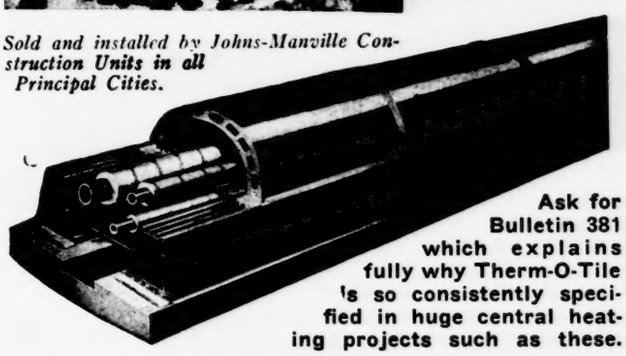
THERM-O-TILE

Reg. U. S. Pat. Off.

UNDERGROUND STEAM CONDUIT

Last year we told you about twelve large N. Y. City Housing Projects that installed Therm-O-Tile. So, this is Job No. 13. See, too, our 1949 Review in the Jan. 1950 issue of Heating, Piping and Air Conditioning.

Sold and installed by Johns-Manville Construction Units in all Principal Cities.



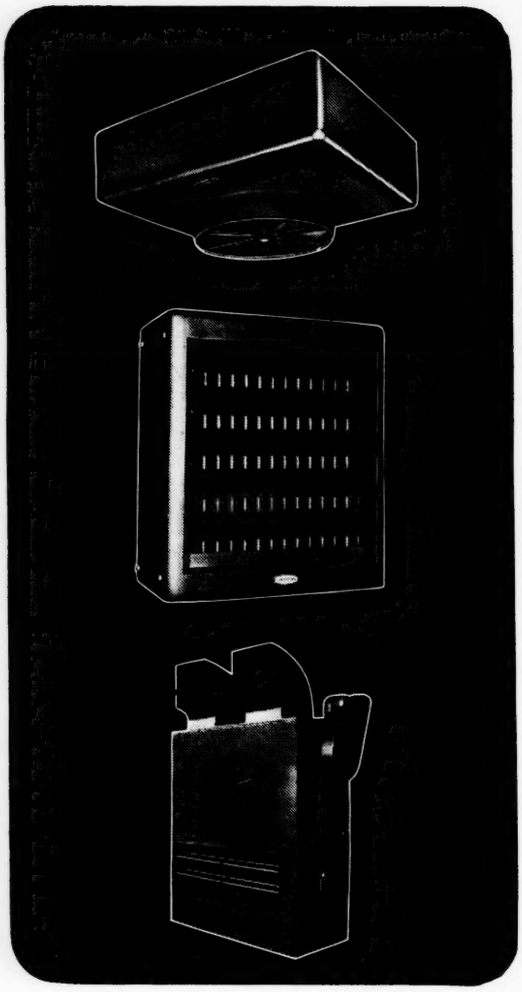
Ask for Bulletin 381 which explains fully why Therm-O-Tile is so consistently specified in huge central heating projects such as these.

H. W. PORTER & CO., Inc.
823-V Frelinghuysen Ave. Newark 5, N. J.

AIRTHERM

Steam Unit Heaters

Save Fuel . . .
Provide Outstanding
Heating Performance



Vertical Delivery Type

Horizontal Delivery Type

Centrifugal Fan Type, for Floor or Suspended Mounting

There's an Airtherm Steam Unit Heater designed to meet every space heating need.

Airtherm offers you Horizontal and Vertical propeller fan types for all commercial and industrial installations plus the Centrifugal fan type for handling large air volume, long heat throw and ductwork resistance.

The long life coils in Airtherm Unit Heaters have copper tubes and copper headers, brazed into an integral heat transfer unit. For complete heating satisfaction try Airtherm on your next job.

Write for Bulletins No. 1208 and 401.

AIRTHERM MANUFACTURING COMPANY
722 South Spring Avenue • St. Louis 10, Missouri

-97

$7 MILLION HOSPITAL

(Concluded from page 111)

brick chimney, steel flag pole, electrical substation and connecting corridor.

The buildings will have concrete foundations, brick-faced exterior walls with stone trim backed with hollow tile, reinforced concrete floors and built-up roofs. The main hospital building will have stone facing backed with brick up to the first story.

WARM AIR CONFERENCE

sponsored by Michigan State College and Warm Air Association will offer four days of classes.

The Department of Mechanical Engineering of Michigan State College in cooperation with the National Warm Air Heating and Air Conditioning Association will conduct the 19th annual forced warm air conference at Michigan State's Olds Hall of Engineering, March 20, 21, 22, 23.

The conference is in the form of a special short course and is under the auspices of the Department of Special Courses and Conferences at East Lansing, Michigan. Registration fee, which includes all luncheons and two dinners, is $25. Extracts from the program for the meeting follow:

Monday, March 20

10:00 a.m.—"Calculating Heat Losses".....J. T. Anderson
11:00 a.m.—"Safety in the Sheet Metal Shop"..J. M. Apple
1:30 p.m.—General Assembly
"Ventilation".....K. E. Robinson
2:30 p.m.—Short Discussion on Choice of Design Problems:
(a) Manuals 5 and 7 (Two-story house)
(b) Manual 7-A (One-story basementless house)
(c) Manual 9 (Small school)

Tuesday, March 21

1:30 p.m.—Report on Branch Takeoff Investigation—L. G. Miller
6:30 p.m.—Banquet—Union (Fun Night)
Chalk Talk—"Hot Air"...F. E. Hockensmith

Wednesday, March 22

1:30 p.m.—"Fan Selection and Sizing"...W. A. Rockafield
2:15 p.m.—"Methods of Figuring Fuel Consumption"—C. H. Pesterfield
6:30 p.m.—Dinner—Union—"Sales".....R. Louis Towne

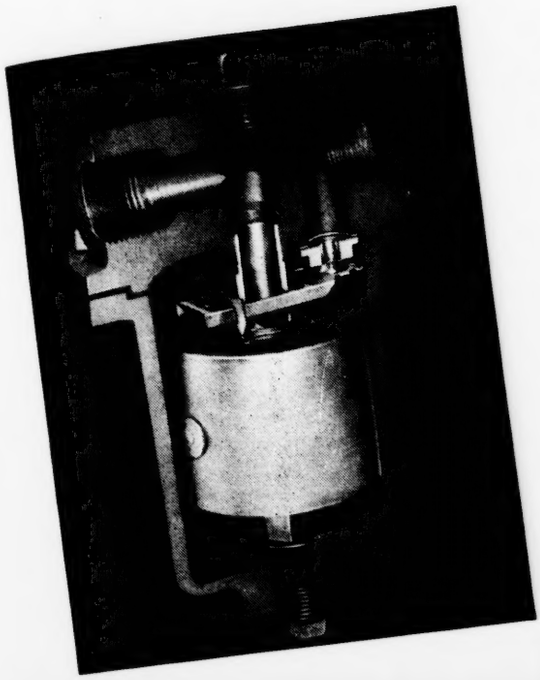
Thursday, March 23

9:00 a.m.—"Installation and Service of Oil Burners"—G. F. Kupel
10:30 a.m.—"Installation and Service of Gas Burners"—Glenn White
12:15 p.m.—Luncheon—"What's Being Done to Heat the Basementless House".....C. W. Nessell

The Inside Story On *WHY YOU SAVE*

with

SUPER-SILVERTOPS



In this cutaway view of an Anderson Super-Silvertop Steam Trap, you can see that all pipe connections are in the head of the trap. The alternate top inlet connection provides for elbow-connection as well as straight-in-line. This means simplified piping, saving up to nine fittings, plus 40 minutes of costly installation time. See how the guided bucked permits the use of a longer lever arm with greater valve opening power. This larger valve means more capacity for the same size trap. Super-Silvertop trapping is efficient trapping . . . *the most economical you can buy.* Learn how to cut your costs by writing for the free 36-page book, "Solving Steam Trap Problems."

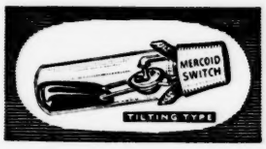
THE V. D. ANDERSON COMPANY
1992 W. 96th Street • Cleveland 2, Ohio

SUPER-SILVERTOPS
SAVE YOU MONEY
straight-in-line or as an elbow

MERCOID

AUTOMATIC CONTROLS FOR HEATING, AIR CONDITIONING, REFRIGERATION AND VARIOUS INDUSTRIAL APPLICATIONS

THE ONLY 100% MERCURY SWITCH EQUIPPED CONTROLS



The distinguishing feature of Mercoid Controls is the exclusive use of Mercoid hermetically sealed mercury switches These switches are not subject to dust, dirt or corrosion, thereby assuring better performance and longer control life. The items shown below are but a few miscellaneous items. See Catalog No. 700 for the complete line.

Pressure Controls

Temperature Controls

Float Operated Controls

Transformer-Relays

Low Voltage Thermostats

Line Voltage Thermostats

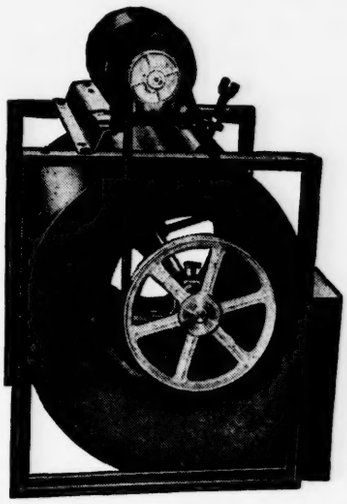
Liquid Level Control

Oil Burner Safety and Ignition Controls

If you have a problem involving the automatic control of pressure, temperature, liquid level, mechanical operations, etc., it will pay you to consult Mercoid's engineering staff — always at your service.

Manufacturers of Dependable Automatic Controls for Over A Quarter of A Century

THE MERCOID CORPORATION · 4223 BELMONT AVE. CHICAGO 41 · ILL.



THE

NEW

UNIVERSAL

TYPE "N"

BLOWER

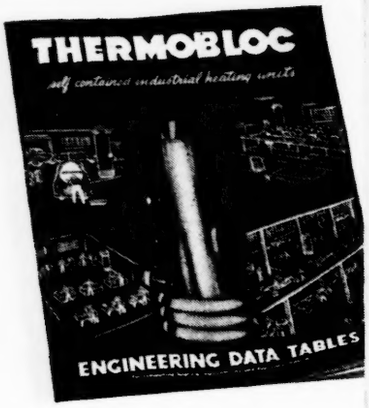
MASSACHUSETTS . .

By changing the position of the oil cup, the four popular discharges (lower horizontal, upper horizontal, down-blast and up-blast) can be obtained. Sizes 7 to 16½ inches wheel diameter.

WRITE FOR BULLETIN No. 110 CATALOG

MASSACHUSETTS BLOWER DIVISION
The **BISHOP & BABCOCK** *Mfg. Co.*
4901 HAMILTON AVENUE · CLEVELAND 14, OHIO

Here's information you've been Looking for!



- Official Design Temperatures for all states and localities.
- Coefficient of Heat Transfer for common industrial construction.
- Heat loss from window and door, ceiling and floor infiltration.
- Heating constants.
- Procedure to determine heat load.
- Procedure to estimate fuel consumption.
- Data on Thermobloc Direct-Fired Unit Heaters.
- Size, capacity, dimension tables of Thermoblocs.
- Comparison of Thermobloc equivalents of steam radiation, steam capacity and horsepower.

THIS DATA BOOK HELPS YOU FIGURE YOUR HEATING *REQUIREMENTS*

A new technical book describes the design and construction of THERMOBLOC, also includes all necessary data for determining heating requirements in any type building. Fill in coupon for a free copy. PROVE THERMOBLOC'S ECONOMY!

THERMOBLOCS are made in two standard sizes, designed to heat the area they serve without duct work or other means of distribution. You'll be amazed at the low initial cost and the economy—realized by heating industrial structures this new, simple way.

If you are planning to install heat in buildings, new or old, let us tell you the whole story of THERMOBLOC's low cost and economical operation.

Fill out this coupon and we'll send you the new Data Book for Heating Engineers together with information about the THERMOBLOC. Our Representatives will be glad to check your requirements.

THERMOBLOC DIVISION

PRAT-DANIEL CORPORATION

70-1 WATER STREET EAST PORT CHESTER, CONN.

Manufacturers of P-D Power Equipment

Gentlemen:

I'm interested in your new Technical Bulletin.

NAME_____ TITLE_____

COMPANY_____

ADDRESS_____

Getting Personal

George Jankauskas

Dr. George Jankauskas *(Sizing Expansion Tanks for Hot Water Heating Systems*, page 87), is now working in heating, ventilating and air conditioning department of V. L. Falotico and Associates, consulting engineers, 26 Court Street, Brooklyn, N. Y. Former member of the technical faculty of the Lithuanian University at Kaunas. Designed, supervised installation, and placed into operation the thermodynamic engineering laboratory for the university. In the years 1938-1939 acted as Consultant with the American-Lithuanian Association for the design of the Ford Motor Co. Copenhagen car mounting factory at Kaunas. Introduced an original method of construction for transporting fuel to the boilers for a sugar factory. In 1941 obtained the degree of Doctor of Technical Sciences. Other work: Assembled a gas generator station for motor power. Designed a steam engine station for a linen factory. Designed and built furnaces for steam and hot water boilers for combustion of low quality fuels. Designed vacuum blower for milk drier, dye drier installation and special evaporator for chemical purposes. Before arriving in this country in 1948, was employed by the Office of the U. S. Military Government for Bavaria, at Munich, as a statistical analyst.

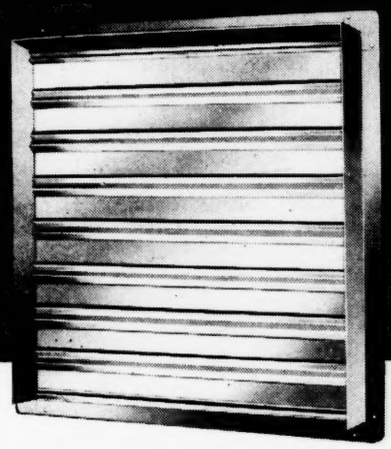
Allen J. Ely, Jr. *(Welding Stainless Steel Pipe*, page 63), mechanical engineering graduate of Lehigh University. A native of New Jersey, he interrupted his college training at the beginning of World War II to serve for several years in the U. S. Merchant Marine as an engineering officer. Following discharge with the rank of Second Assistant Engineer, he completed work for his degree and was subsequently employed by the Standard Oil Company of New Jersey as a test engineer in the Technical Service Division. For the last two years he has been engaged in various engineering projects for Taylor Forge & Pipe Works, where he functions as staff engineer for some of the non-technical divisions of the Company.

. . . Since the Last Issue

On January 1, 1950, **Crane Co.** acquired the **United Plumbing and Mill Suppliers, Inc.**, 756 S. First St., Louisville, Ky., and will operate this business as the Crane Louisville branch. Heading the new organization is **Charles E. Sims**, former assistant manager of the New York branch.

The merger of **American Air Filter Co., Inc.**, Louisville, Ky., manufacturer of air filters and dust collectors, and **Herman Nelson Corp.**, Moline, Ill., makers of heating and ventilating equipment, became effective as of January 6, 1950, according to an announcement made by W. M. Reed, president of the American Air Filter Co., surviving corporation. The Nelson corporation henceforth will be operated as the Herman Nelson Division of American Air Filter Co., Inc., and will continue to maintain its headquarters and facilities in Moline. The merger company's principal offices and headquarters will be in Louisville, Ky. W. G. Frank, executive vice president, and Richard H. Nelson have been elected directors of the combined firm. Richard H. Nelson and Robert W. Nelson have been elected vice presidents of the enlarged firm, and E. G. Mason of the Herman Nelson Division has been elected assistant secretary and assistant treasurer.

they all want AIR-FLO



MODEL A-555

THE AUTOMATIC SHUTTER WITH ALL THE FEATURES

Front View—Closed

IT TAKES THE LOAD OFF THE FAN!

Aluminum louvers open fully, permitting capacity fan operation. New heavy reinforcement strip adds strength and long life to the louvers, assures quiet operation and perfect counterbalance, prevents rattling. Deep shroud protects shutter from high winds. Tie-rod, brackets and bearings inside frame, not exposed to weather. Special finish resists corrosion. Many other features.

Write for New Air-Flo Catalog 43-F

Illustrations and details of the complete Air-Flo line.

AIR CONDITIONING PRODUCTS CO.

2340 W. LAFAYETTE BLVD. • DETROIT 16, MICH.

FOR VENTILATION, DUST AND FUME CONTROL

LIGHT, STRONG, FLEXIBLE

FLEXAUST

SPIRAL-REINFORCED HOSE

Flexaust is suitable for a wide variety of suction and pressure uses in ventilation, dust collection and fume control. **SIZES 1¼ inches to 24 inches.** Write for full information on this all-purpose hose. Various Flexaust types, accessories, and other hose types also available:

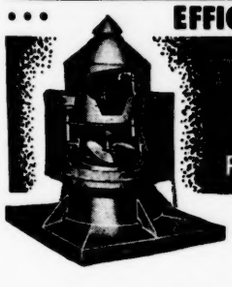
BLOFLEX *Non-reinforced collapsible*

PORTOVENT *Ring-reinforced retractable*

AMERICAN VENTILATING HOSE CO.

Dept. HV-2, 15 Park Row, New York 7, N. Y.
Branch Offices: New Orleans, La.; San Francisco, Calif.; Washington, D. C.
Plant: Amesbury, Massachusetts

EFFICIENT, LOW COST AIR REMOVER



Muckle **VENTS**

POWER DRIVEN ROOF EXHAUSTER

For stores, cafes, bakeries, laundries, garages, etc. Built to function in wet air—motor is out of line of air flow. A compact, sturdy, easy-to-install package unit. Sizes 370 to 13,080 C.F.M. air delivery. Fits any roof. *Write us about YOUR problem.*

MUCKLE MANUFACTURING CO. • OWATONNA 3, MINN.

Capable of handling either LOW or HIGH VELOCITIES*

RESEARCH with resultant performance data has developed and proved a line of new Multi-Velocity Air Filters . . . super-efficient air filters capable of handling either LOW or HIGH Velocities . . . in a single unit!

Features include . . . increased efficiency at all air velocities up to 550 feet per minute . . . lower restriction at all air velocities . . . increased depth loading . . . highest dirt holding capacity . . . exclusive non-clogging design . . . improved cleanability . . . PLUS . . .

Double Filtration.** The baffle pattern of the filter reduces in size of apertures through the first half of the filter . . . then starts anew with larger apertures and reduces again . . . A DOUBLE FILTRATION PROCESS!

Ask your distributor about this great line of R-P air filters. If you have not received your copy of our new portfolio, R-P MULTI-VELOCITY AIR FILTERS, write today! Address Research Products Corp., Madison 10, Wis., Dept. V. Canadian Representative—Delhi Industries, Delhi, Ontario.

*MULTI-VELOCITY AIR FILTERS

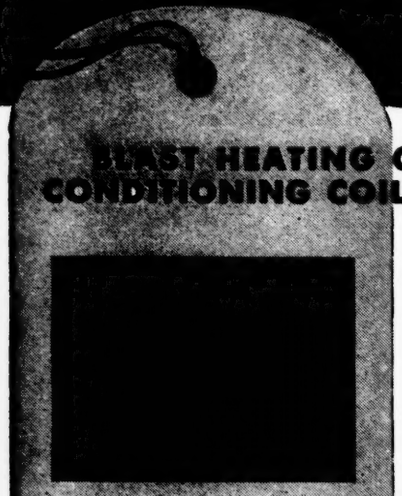
**Pat. Applied For

Illustrated is the R-P Copper Industrial Multi-Velocity Filter. Also available in the Multi-Velocity line is the R-P Heavy Duty Industrial, R-P Alumaloy Industrial and R-P Alumaloy Grease Filter.

RP . . . PRODUCTS OF RESEARCH

WASHABLE AND REPLACEMENT AIR FILTERS • GREASE FILTERS • EVAPORATIVE COOLER MATERIALS

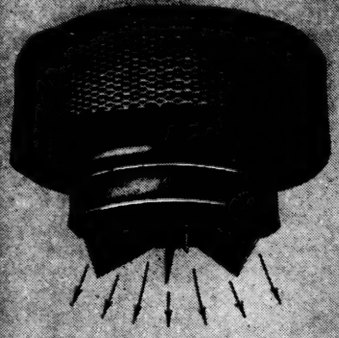
McCORD
HEATING AND AIR CONDITIONING PRODUCTS



BLAST HEATING COILS—AIR CONDITIONING COILS—ALL TYPES

All copper spiral fin tube construction with the tubes formed or bent permits uniform expansion without strain. Headers are heavy wall construction with tubes brazed into extended ferrules formed in the headers. Fins are helically wound and metallically bonded. May we send catalog?

VERTICAL TYPE UNIT HEATERS



A proven heating unit, modern in design, incorporating every unit heater advancement. McCord copper spiral fin tube construction creates air turbulence without undue restriction. Improved fan blades deliver large volume of air with minimum air noise. Guaranteed for 150 lbs. saturated steam pressure. Specify McCord.

HORIZONTAL TYPE UNIT HEATERS

A time proven heating unit, modern streamlined in design, quiet, yet its rugged construction adapts it to all types of installations, guaranteed for use on No. 150 p. s. i. steam pressure. All copper heating element, individual spiral fin tubes free to expand without strain on joints. Standard motors with standard bases used. Wide range of capacities.

Save fuel with McCord Unit Heaters.

McCord CORPORATION
DETROIT 11, MICH.

H. D. Bissell

Herbert D. Bissell, former general advertising manager of The Electric Auto-Lite Co. of Toledo, has been appointed executive in charge of the advertising, sales promotion and merchandising departments of **Minneapolis-Honeywell Regulator Co.** Mr. Bissell, who joined Electric Auto-Lite in 1941, was graduated from Dartmouth College in 1929 and immediately joined N. W. Ayer & Son, Inc. He became account executive on the Ford Motor Co. account for the agency. Honeywell plans to expand its promotional and advertising activities under Mr. Bissell's direction. Managers of the sales promotion, advertising and merchandising departments will continue in their present capacities under the new executive who will be in charge of all promotion departments of the company, including those of its various manufacturing and sales divisions.

The following men have been appointed district representatives for **Kritzer Radiant Coils: Pat Savage,** headquarters in New York City and covering metropolitan New York City, northeastern New Jersey and southwestern Connecticut; **Wm. J. O'Brien,** of the O'Brien Specialty Co., with headquarters in Syracuse and covering New York State with the exception of metropolitan New York City; **H. L. Keene,** of the Thermal Equipment Co., with headquarters in Boston, Mass., and covering the eastern part of Massachusetts, New Hampshire and Maine. **Merrill Blankin,** of the Blankin Equipment Corp., with headquarters in Philadelphia and covering the eastern part of Pennsylvania, southern New Jersey, Delaware and eastern Maryland.

O. J. Prentice, since 1920 advertising manager for **C. A. Dunham Co.,** retired Dec. 31, 1949 at the age of 83. His resignation was officially accepted at a banquet given in his honor at the Chicago Bar Association, Thursday, January 5. For more than a half century, Mr. Prentice has been engaged in advertising and public relations work. He was with Long-Critchfield & Co. from 1894 until 1907. He was western representative for N. W. Ayer & Son from 1907 until 1920 when he joined C. A. Dunham as advertising manager. Mr. Prentice has long been prominent in business organizations closely identified with the heating field. He is a life member and past president of the Illinois chapter of ASHVE and is a member of NDHA and NAPE.

Tube Turns of Canada, Ltd., which was granted its Dominion charter on December 2nd, is establishing a modern plant in Chatham, Ontario. The company will manufacture Tube-Turn welding fittings.

A. J. DeFino

Announcement of the appointment of **Anthony J. DeFino** as general manager of the Buffalo Division is made by the **Fedders-Quigan Corp.,** manufacturers of automotive, refrigeration, air conditioning, heating and water cooling equipment. Mr. DeFino has held key positions in various phases of the company's sales and manufacturing activities centering around heat transfer equipment. Following release from active duty in the Armed Forces during World War II, Mr. DeFino joined the Fedders-Quigan Corporation in the Industrial Heating and Refrigeration Division, after which he became sales manager of the Condenser Division and, finally, the Automotive Division, which includes volume manufacture and sale of automotive radiators, car heater cores, and refrigeration component parts which are used as standard equipment by America's foremost manufacturers of automobiles and refrigerators.

York-Shipley, Inc., manufacturers of York-Heat oil burning equipment, announce three promotions in their own and their subsidiary organizations: **Frank M. Halloran** became manager of the Boston residential division of the company, the operating New England distributor branch. **R. B. Snyder** has been appointed sales coordinator of the Shipley Cooling and Heating Co., York, Pa., sales division of the manufacturer. **J. C. Hauf, Jr.**, becomes regional sales manager of the southern region of the company, covering distribution outlets from Baltimore south.

Surface Combustion Corp. has appointed **Charles C. Owen** sales promotion manager of the Janitrol Division. Mr. Owen will direct the Janitrol sales training program as well as the general sales promotional activities of that division. Since joining the Surface Combustion organization in 1936, he has been in charge of the Cincinnati Janitrol district office.

The appointment of **Buel A. Devine** as jobbers' field representative has been announced by the **Wolverine Tube Division** of the **Calumet & Hecla Consolidated Copper Co.** Previous to this appointment Mr. Devine had spent sixteen years with the Mueller Brass Co. in a sales capacity.

C. Mason Gerhart, who has been assistant to the commercial sales manager of the **York Corp.**, Houston, Tex., was transferred to the home office of the air conditioning and refrigeration firm at York, Pa., as a sales engineer.

R. E. Barnett

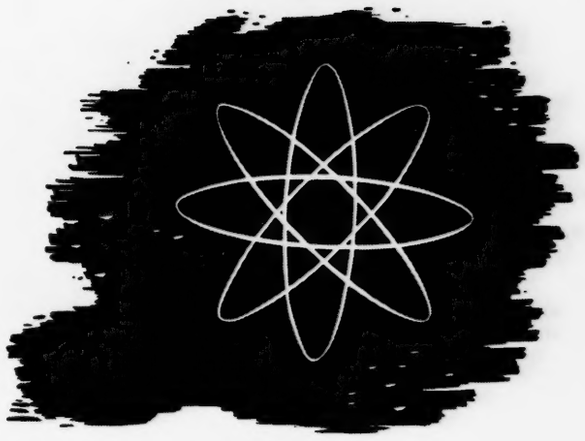
R. E. Barnett has been promoted to assistant sales manager of **Marsh Instrument Co.**, sales affiliate of **Jas. P. Marsh Corp.** Mr. Barnett has been with the Marsh organization for the past nine years in a sales capacity with headquarters at the company's home office in Skokie, Illinois. Among his new duties, Mr. Barnett will work in close contact with the company's nationwide sales organization to promote and maintain maximum coordination with the Marsh Instrument home office.

On December 1, **W. G. Tolman** joined the staff of **C. A. Dunham Co.** at the Michigan City plant as production manager. He had previously been retained in a consulting capacity to develop improved manufacturing methods and supervise the purchase of new equipment. Mr. Tolman came to the Dunham Company from the Harry Ferguson tractor plant in Detroit.

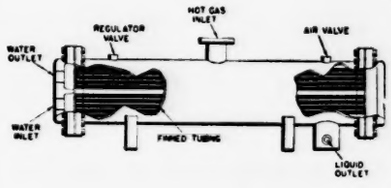
Robert T. Pring has been appointed technical director of the dust and fume division of **American Wheelabrator & Equipment Corp.**, Mishawaka, Indiana.

Robert L. McFadin has been named manager of the merchandising sales department of **The Marley Co., Inc.**, and as a result, has transferred to the main offices of the company in Kansas City, Kansas. For the past year he had been in charge of merchandising sales in the New York office, and in his new position will have charge of such sales for the entire Marley organization.

Mryon S. Curtis, who was appointed assistant to the president of **The Youngstown Sheet & Tube Co.** effective Jan. 1, began with the company more than 38 years ago. A native of Washington, D. C., Mr. Curtis attended public schools there, then went to George Washington University specializing in chemical engineering. In October, 1911, Mr. Curtis joined The Youngstown Sheet and Tube Company, working in the Tube Mill at Campbell. After varied experience in both production and sales, Mr. Curtis was appointed advertising manager in 1929, and the following year was made manager of sales promotion, a position he has held ever since. Last year he also was appointed manager of the company's Industrial Development Division.

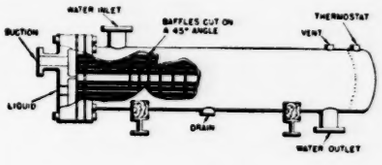


Electronic tube expanding for Patterson *freon coolers and condensers*



Patterson freon condenser
type O fin tube construction

Electronic Engineering has found the way to provide automatic, regulated control when expanding tubes in the tube sheet. The operator sets the electronic control at a predetermined point, selected for the kind of metal used and size of tube to be expanded. Just the right pressure and timing—automatically.



Patterson freon cooler
dry expansion type

Electronic tube expanding eliminates the chances of human error . . . chances of either overexpanding, resulting in overstressed metal or underexpanding, resulting in probabilities of early leakage and high maintenance.

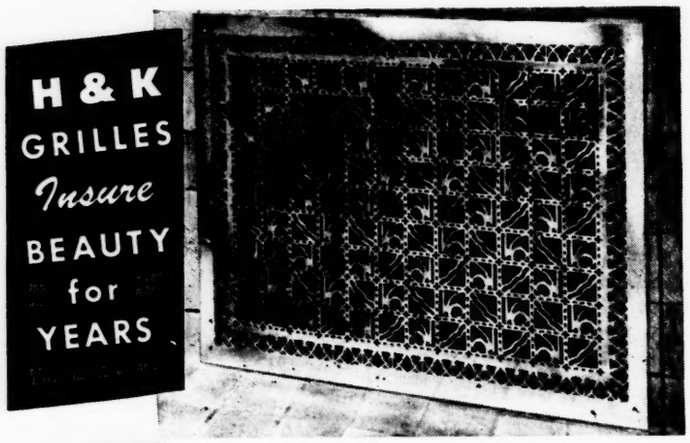
In our shop, all tube expanding operations are carried on under Precision Electronic Control. Metal to metal joints are tight, strong, and safe . . . a plus value to be found in all Patterson-Kelley Freon Coolers and Condensers.

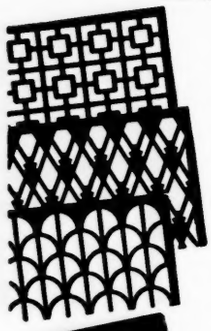
Freon Cooler Catalog available upon request

The **Patterson-Kelley Co., Inc.**

96 Burson St., East Stroudsburg, Pa.

Offices or Representatives in Principal Cities





Our new grille catalog No. 33 sent upon request.

Complete concealment, yet ample open area for proper air circulation. Grilles for heating and air conditioning systems with damper controls if required.

A wide range of grille patterns from which to choose. Fabricated in stainless, bronze, aluminum or steel and furnished with care and precision.

Quality of workmanship insures the lasting beauty of H & K ornamental grilles.

Send us your specifications so we may quote on your requirements of grilles and registers.

Harrington & King Perforating Co

5664 Fillmore St., Chicago 44, Ill.
114 Liberty St., New York 6, N. Y.

Dependable Positive Protection

D.I.P.
REG. U. S. PAT. OFF.

Pre-Sealed Insulation for Steam, Hot Water or Refrigerants

When you must have unfailing operation over long years of service, you will find DURANT INSULATED PIPE has outstanding advantages that merit preference over many more costly methods of insulation.

D. I. P. solves the problems of electrolysis, corrosion and waterproofing, either underground or exposed — field work is simple and cuts installation costs — efficiency does not lessen with age — no tile or masonry protection are required.

Our representatives throughout the country are at your service. DURANT catalog and engineering data will be supplied on request.

PRE SEALED
REG. U. S. PAT. OFF.

DURANT INSULATED PIPE COMPANY
1015 Runnymede St. East Palo Alto, California

Arthur P. Shanklin, vice president of **Carrier Corp.,** has been placed in charge of its staff division, and will be succeeded as head of the sales division by **O. W. Bynum,** who has been elected a vice president. Mr. Shanklin joined the Carrier organization in 1922, immediately after graduation from the University of Kentucky as a mechanical engineer. He was elected a vice president in 1942. Mr.

A. P. Shanklin

O. W. Bynum

Bynum was named general sales manager early in 1949, after serving in engineering, sales and management capacities in the south and middle-west. A graduate of the University of Alabama, Mr. Bynum earned his degree in electrical engineering at Alabama Polytechnic Institute in 1930. He became associated with Carrier the same year as a student engineer.

Geo. B. Limbert & Co., Inc., 208 S. LaSalle St., Chicago, Ill., has been appointed representative for **Dravo Corp.,** Pittsburgh, in the sale and installation of fabricated piping for industrial plants, oil fields, central utility stations, water works, gas transmission systems and other services.

Joy Manufacturing Co., Oliver Building, Pittsburgh, Pa., has announced the appointment of **H. B. Zeppenfeld** as manager, industrial sales, Mines Equipment Division. Mr. Zeppenfeld, a graduate of the School of Commerce and Finance, Saint Louis University, had more than twenty years of management experience with several industrial organizations. During the war he served on the War Production Board. From there he went to the Mines Equipment Division as procurement manager and later entered sales management.

B. J. Lattner, vice president, succeeds **M. D. McWilliams** as director of heating equipment sales for **Century Engineering Corp.,** Cedar Rapids, Iowa. Mr. McWilliams is retiring after more than twenty years with Century.

Leonard P. Jenkins has been appointed assistant sales manager, plumbing division of the **Richmond Radiator Co.** Mr. Jenkins, who joined Richmond in April 1946, was formerly director of sales promotion for the Barcley Company of Newark, N. J., and assistant sales manager of the Service Supply Corp., Philadelphia, Pa.

York Corp. has announced the appointment of **William R. H. Eby,** a native of Oakland, Calif., to the newly created position as industrial sales manager of the Pacific District with headquarters in Los Angeles. Until recently Mr. Eby had been serving York Corporation as branch manager at Seattle.

York-Shipley, Inc., manufacturers of York-Heat, has announced the establishment of a greatly expanded merchandising division. Heading the new division as manager is **Dave Wepman,** who has been active in the oil heating industry for over 20 years. **W. W. Kane,** who came up through the York-Shipley organization, and who has most recently been in charge of York-Heat cooperative advertising, moves up as coordinator of the new division.

Dravo Corp., Pittsburgh, Pa., has announced the appointment of **Condaire, Inc.**, 3248 Gravois, St. Louis, as distributor of Dravo "Counterflo" Heaters in eastern Missouri and the southern half of Illinois.

Robert B. Taylor, of Newark, Ohio, took over his new duties as research director for the **Structural Clay Products Research Foundation** this week. He will immediately begin the planning for an industry-wide, long-range research program in the brick and tile industry from his headquarters at 1520 18th St., N. W., in Washington, D. C. Mr. Taylor has been assistant research director of the Owens-Corning Fiberglas Corp., at Newark, Ohio. He is 36 years old, an alumnus of Denison University and Ohio State University. He was born in Nanking, China, the son of Baptist missionaries. He has been associated with Fiberglas since 1936.

Minneapolis-Honeywell Regulator Co. has opened a new branch office in Binghamton, N. Y., bringing the total number of Honeywell branch and regional offices in the United States and Canada to 78.

Illinois Engineering Co. has announced that they have appointed the **Thomas Engineering Co.**, 1325 East 35th St., Tulsa, Oklahoma, as their representative for the State of Oklahoma.

Wayne D. Staley, formerly New York district manager for **The Duriron Co.**, has been appointed general sales manager and will be located at the home office of the company in Dayton, Ohio. In directing sales and advertising activities, he will replace D. E. Jack, who has resigned as vice president in charge of engineering and sales. **R. F. Sharpe**, former manager of the Philadelphia office, has been appointed New York district manager. **Ralph L. Watts**, who was formerly sales engineer in New York, will be in charge of the Philadelphia office.

H. S. Colby, formerly identified with the Riley Stoker Corp., Worcester, Mass., and Combustion Engineering Co., Inc., New York, N. Y., has joined the **Springfield Boiler Co.** as assistant to the president.

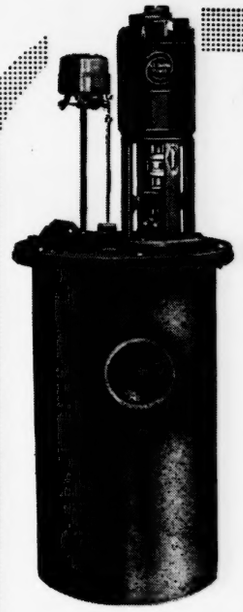
United States Radiator Corp. announces the appointment of **Edwin L. Malm** as manager, hot water and steam accessories division.

Kenneth B. Rolf has been appointed assistant sales manager for the Insulite Division of **Minnesota and Ontario Paper Co.**

INDUSTRIAL DEGREE-DAYS
December, 1949

City	55F Base	45F Base
Baltimore, Md.	422	165
Buffalo, N. Y.	673	382
Chicago, Ill.	652	359
Cleveland, Ohio	646	361
Detroit, Mich.	683	385
Indianapolis, Ind.	595	314
New York, N. Y.	461	200
Philadelphia, Pa.	448	186
Pittsburgh, Pa.	536	273
St. Louis, Mo.	443	185

Sound Construction

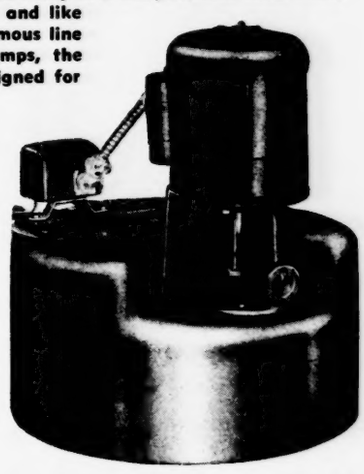


LET SKIDMORE BE YOUR GUIDE

"time tested favorite"

● Day in and day out dependability, year in and year out service. You can be sure that a Skidmore Pump will do the job efficiently. Every Skidmore Pump is built for a specific type of installation and backed by **sound construction.** Skidmore Pumps have been a favorite for over a quarter of a century.

Type UV Pump is built in either single or duplex units for handling below floor level returns. Type CV Vertical Condensation Pump is a compact unit used where space is limited and like others of the famous line of Skidmore Pumps, the CV Pump is designed for returning condensation to the boiler or other points.



Above: Type No. "UV"

Right: Type No. "CV"

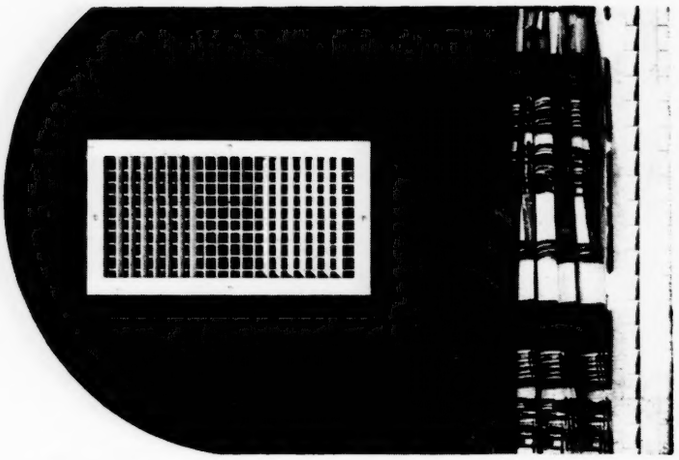
SEND FOR FULL DETAILS TODAY!

Skidmore Pumps

ST. JOSEPH, MICHIGAN

"AUER Streamliner"

REGISTERS and GRILLES
— for high velocity outlets

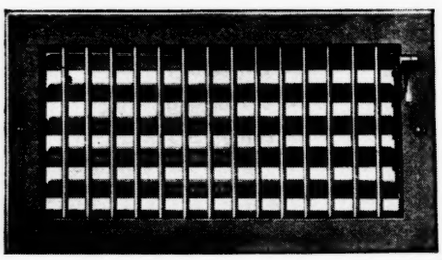


Streamliner wall registers and grilles afford a wide range of multiple deflection for air conditioning, ventilating, or cooling systems. They provide correct diffusion for high velocity outlets.

Bars are hollow moulded, beveled, perfectly formed, and smooth in contour. They are pivoted in the frame on special split sleeves, or expansion inserts, which furnish proper tension to hold bars firmly when set, yet allow easy adjustment to the desired angle with one simple tool. Bars are shaped like an airplane wing in cross-section, and pivoted at the exact center, so they can be turned completely around. Some users prefer to turn the thin edge outward for outlets (and the broader edge toward the flow of air) cutting resistance and turbulence to a minimum. Bars may be set at any angle, in any grouping. Shutters of multi-louvre valves are pivoted on rivets to prevent vibration. All Streamliner registers are equipped with gaskets. Write for Folder S-49 with sizes and list prices.

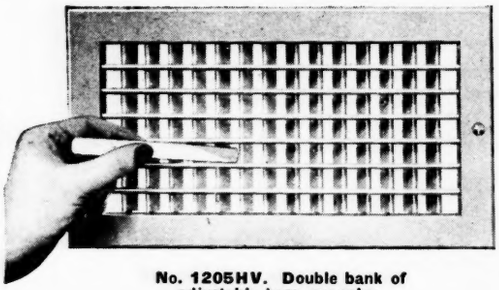
8 MODELS

The Series includes models with single bank of adjustable bars (vertical or horizontal), also with double bank of adjustable bars (vertical in front and horizontal in back, or the reverse), also all above four types with the addition of horizontal multi-louvre valves in the rear, controlled by lever on face of register.



No. 1005V-HML. Single bank of adjustable bars, with multi-louvre valve.

Complete Auer Register Book —or Catalog "G" on perforated grilles— sent on request.



No. 1205HV. Double bank of adjustable bars, no valve.

THE AUER REGISTER CO., 3608 Payne Avenue, CLEVELAND 14, OHIO

Auer REGISTERS
& GRILLES for AIR CONDITIONING & GRAVITY

Canadian Degree-Days for December, 1949*

City	December		Cumulative Sept. 1 to Dec. 31	
	1949	Normal	1949	Normal
Calgary, Alta.	1826	1426	3712	3702
Charlottetown, P. E. I.	1097	1246	2688	2865
Crescent Valley, B. C.	1237	1240	3162	3279
Edmonton, Alta.	1944	1578	3999	3984
Fort William, Ont.	1575	1596	3794	3815
Grand Prairie, Alta.	2003	1649	4112	4159
Halifax, N. S.	941	1138	2233	2615
London, Ont.	1107	1200	2654	2677
Medicine Hat, Alta.	1758	1417	3390	3389
Moncton, N. B.	1162	1373	2899	3186
Montreal, P. Q.	1220	1407	2889	3096
North Bay, Ont.	1429	1528	3547	3503
Ottawa, Ont.	1327	1494	3120	3277
Penticton, B. C.	1175	1073	2721	2626
Porquis Junction, Ont.	1699	1786	4128	4248
Prince George, B. C.	1702	1504	3799	3757
Quebec City, P. Q.	1342	1534	3129	3511
Regina, Sask.	1974	1779	4158	4336
St. John, N. B.	1091	1271	2630	2969
Saskatoon, Sask.	2062	1767	4265	4249
Toronto, Ont.	1017	1155	2380	2644
Vancouver, B. C.	898	818	2161	2168
Victoria, B. C.	803	738	1959	1910
Windsor, Ont.	1011	1172	2259	2446
Winnipeg, Man.	1897	1829	4017	4205

*These data are supplied through the courtesy of the Meteorological Division, Air Service Branch, Department of Transport, Canada.

COMING EVENTS

Where listed, names or titles of individuals are those from whom further information is available.

ENGINEERING SOCIETIES EXPOSITION—5th annual engineering exposition of the Minnesota Federation of Engineering Societies, at Minneapolis Armory, Minneapolis, Minn. Show manager, Brede Inc., 1720 New Brighton Blvd., Minneapolis 13, Minn. ..... **FEBRUARY 21-23, 1950.**

CONTRACTORS CONVENTION—1950 convention of The Associated General Contractors of America, Inc., at San Francisco, Calif. Wm. G. Dooly, Jr., staff member, Munsey Building, Washington 4, D. C. ..... **FEBRUARY 27-MARCH 2, 1950.**

MATERIALS MEETING—Spring meeting of the American Society for Testing Materials, at Hotel William Penn, Pittsburgh, Pa. Secretary of Society, 1916 Race St., Philadelphia 3, Pa. ..... **FEBRUARY 27-MARCH 3, 1950.**

WARM AIR CONFERENCE—19th annual Forced Warm Air Conference, sponsored by Michigan State College in cooperation with National Warm Air Heating and Air Conditioning Association, at Michigan State College, East Lansing 14, Mich. ..... **MARCH 20-23, 1950.**

REFRIGERATION MEETING — 1950 annual meeting of the Refrigeration Equipment Manufacturers Association, at Edgewater Beach Hotel, Chicago, Ill. Show Director, REMA, 1107 Clark Bldg., Pittsburgh 22, Pa. .... **MARCH 30-APRIL 1, 1950.**

CORROSION CONFERENCE AND SHOW—1950 annual conference and exhibition of the National Association of Corrosion Engineers, at Jefferson Hotel, St. Louis, Mo. Secretary of Association, 919 Milam Bldg., Houston 2, Texas. ..... **APRIL 5-7, 1950.**

POWER CONFERENCE—12th annual Midwest Power Conference, sponsored by Illinois Institute of Techology, at Hotel Sherman, Chicago. Conference director, Roland A. Budenholzer, at Illinois Tech, 3300 S. Federal St., Chicago 16, Ill. .....**APRIL 5-7, 1950.**

ASME MEETING—Spring meeting of the American Society of Mechanical Engineers, at Hotel Statler, Washington, D. C. C. E. Davies, secretary, 29 W. 39th St., New York 18, N. Y. .....**APRIL 12-14, 1950.**

PROCESS INDUSTRIES CONFERENCE—Process Industries Division Conference of the American Society of Mechanical Engineers, at William Penn Hotel, Pittsburgh, Pa. C. E. Davies, secretary, 29 W. 39th St., New York 18, N. Y. .....**APRIL 24-26, 1950.**

OIL HEAT EXPOSITION — National Oil Heat Exposition, in conjunction with the 27th annual convention of Oil-Heat Institute of America, at Commercial Museum, Philadelphia, Pa. C. F. Curtin, secretary, 6 E. 39th St., New York 16, N. Y. .....**APRIL 24-28, 1950.**

SHEET METAL CONVENTION—Annual convention of Sheet Metal Contractors Association of Illinois, Inc., at State Armory Building, Springfield, Ill. Geo. L. Folkers, convention chairman, 709 S. Adams St., Peoria, Ill. .....**APRIL 27-29, 1950.**

CONTRACTORS MEETING — 1950 annual meeting of the Heating, Piping, and Air Conditioning Contractors National Association, at St. Francis Hotel, San Francisco, Calif. Secretary of Association, 1250 Avenue of the Americas, New York 20, N. Y. .....**MAY 8-12, 1950.**

NDHA MEETING — 41st annual meeting, National District Heating Association, at Grove Park Inn, Asheville, N. C. John F. Collins, Jr., secretary of Association, 827 N. Euclid Ave., Pittsburgh 6, Pa. .....**MAY 23-26, 1950.**

ASRE MEETING—Spring convention of the American Society of Refrigerating Engineers, at Hotel Muehleback, Kansas City, Mo. M. C. Turpin, secretary, 40 W. 40th St., New York 18, N. Y. .....**JUNE 4-7, 1950.**

AUTOMOTIVE ENGINEERS MEETING — Summer meeting, Society of Automotive Engineers, at French Lick Springs Hotel, French Lick, Ind. John A. C. Warner, secretary of Society, 29 W. 39th St., New York 18, N. Y. .....**JUNE 4-9, 1950.**

ASME MEETING—Semi-annual meeting of the American Society of Mechanical Engineers, at Hotel Statler, St. Louis, Mo. C. E. Davies, secretary, 29 W. 39th St., New York 18, N. Y. .....**JUNE 19-23, 1950.**

PETROLEUM CONFERENCE—Petroleum Mechanical Engineering Conference at Hotel Roosevelt, New Orleans, La. Secretary, American Petroleum Institute, 50 W. 50th St., New York, N. Y. .....**SEPTEMBER 25-27, 1950.**

AGA CONVENTION AND EXPOSITION—Biennial Exposition of Gas Appliances and Equipment, in conjunction with 1950 annual convention of the American Gas Association, at Convention Hall, Atlantic City, N. J. Secretary, AGA, 420 Lexington Avenue, New York 17, N. Y., and secretary, Gas Appliance Manufacturers Association, 60 E. 42nd St., New York 17, N. Y. .....**OCTOBER 2-6, 1950.**

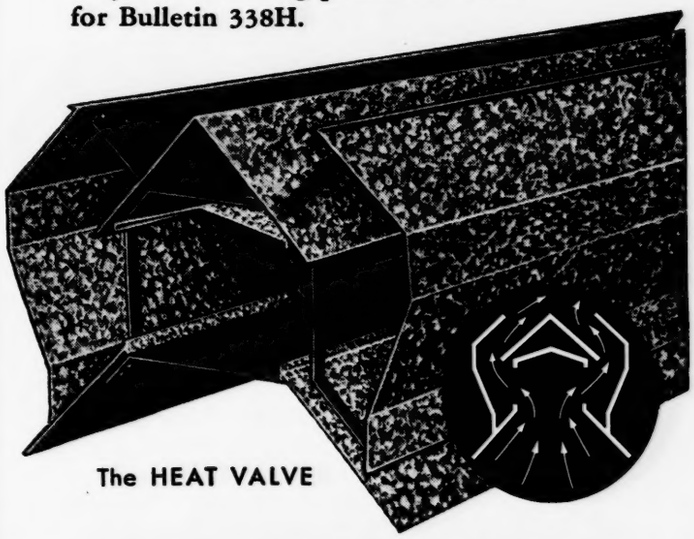
ASRE MEETING—Annual convention of the American Society of Refrigerating Engineers, at Hotel Commodore, New York. M. C. Turpin, secretary, 40 W. 40th St., New York 18, N. Y. .....**DECEMBER 3-6, 1950.**

REFRIGERATION SHOW—7th All-Industry Refrigeration and Air Conditioning Exposition, at Navy Pier, Chicago, Ill. Show director, REMA, 1107 Clark Bldg., Pittsburgh 22, Pa. .....**NOVEMBER 5-9, 1951.**

The AIRMOVER

For Low Cost *Natural* Ventilation it's good business to use these Swartwout Ventilators

Beat the cost of power and expensive duct work when *Natural* (gravity) ventilation will do the job. In thousands of industrial and commercial buildings Swartwout AIRMOVER and Swartwout-Dexter HEAT VALVE move enormous quantities of heat, smoke and fumes at *no after-installation cost* except small maintenance. And original cost is economical per square foot of opening. . . . It pays you to get Swartwout help on your ventilating problems. Write for Bulletin 338H.



The HEAT VALVE

18511 Euclid Avenue, Cleveland 12, Ohio.

The Swartwout Co.

Industrial Ventilation Specialists Since 1904

Equipment for Controlled Air Circulation